Washington State Department of Transportation

Materials Laboratory
Environmental Health & Safety Manual

M 46-04

WSDOT Materials Laboratory
PO Box 47365
1655 S. 2nd Avenue
Tumwater, WA 98512

Foreword

The WSDOT Materials Laboratory Environmental Health and Safety Manual is a compilation of applicable hazardous materials, hazardous waste, fire, and worker health and safety procedures that the Materials Lab must follow. The Environmental Health and Safety Manual outlines the legal requirements related to these procedures.

This information is meant to be a training and reference tool to people working in the Materials Laboratory. In addition to being a helpful guide this manual consolidates policies and procedures that are required to be on site for regulatory inspections.

This manual will be available on:
(http://www.wsdot.wa.gov/fasc/EngineeringPublications/manuals/MatsLab.pdf)
and in hard copy throughout the WSDOT Materials Laboratory. We will update this manual on an on-going basis. Users are encouraged to submit revisions and suggestions to the Lab Administrative Manager to help guide future updates.

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WSDOT Materials Laboratory

Environmental Health & Safety Manual

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Washington State Department of Transportation

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Acronyms

	A
AASHTO	American Association of State Highway Transportation Officials
ATMS	Automated Training Management System
	C
CAS	Chemical Abstract Service
CFR	Code of Federal Registry
	E
EMP	Environnemental Management Programme
EMS	Environmental Management System
	H
HMMP	Hazardous Materials Management Plan
	I
IFC	International Fire Code
	M
Materials Lab	Materials Laboratory
MSDS	Material Safety Data Sheet
	N
NFPA	National Fire Protection Association
	O
OSHA	Occupational Safety and Health Administration
OJT	On-the-job Training
	P
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
	W
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WSDOT	Washington State Department of Transportation

Chapter 1 Background and Introduction

1.1 Overview

Introduction

This chapter contains the background, introduction, and environmental regulatory requirements that necessitate the preparation of this document.

Contents

This chapter contains the following topics:

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1.2 Background

Introduction

The Washington State Department of Transportation (WSDOT) Materials Laboratory (Materials Lab) is an American Association of State Highway Transportation Officials (AASHTO) accredited laboratory located in Tumwater, Washington.

Linkage to Environmental Management System (EMS)

An Environmental Management System (EMS) represents a comprehensive approach for addressing the environmental aspects and impacts of an organization. It includes the policies, procedures, tools, training, and auditing elements required to ensure that potential environmental impacts are effectively addressed.

Environmental Management Programs (EMPs) are being developed throughout WSDOT's operations. EMPs are key building blocks of WSDOT's EMS. Each operational area is developing its own EMP and associated environmental documentation. This manual supports the Materials Lab's EMP.

Environmental Management Program

WSDOT is developing EMPs that apply to each of our various operations. The work of the Department (from highway construction, to maintaining the systems, to operating the ferries, to maintaining facilities) is so diverse that one program could not address all our needs. Each of the EMPs will address the following seven core elements:

- Legal and other requirements, including pertinent environmental laws, regulations, and agreements that apply to operations
- Written procedures that instructs staff and contractors how to conduct work operations in compliance with requirements
- Training that ensures that those conducting certain operations know how to do the work in a compliant manner
- Roles and duties that ensure WSDOT staff and contractors know what their responsibilities are under the EMP
- EMP auditing that includes recording compliance and corrective actions.
- Communication
- Performance measurements.

1.3 Introduction

Purpose

The purpose of this document is to define the policies and procedures designed to safeguard personnel and the environment from deleterious effects associated with the procurement, use, and disposal of hazardous chemicals. This manual incorporates information required under the Chemical Hygiene Plan (WAC 296-62-400), Dangerous Waste Regulations (WAC 173-303), Chemical Hazard Communication (WAC 296-800-17035), and the Hazardous Materials Management Plan (HMMP) required by the International Fire Code.
This manual also supports the Materials Lab's EMP, and as a result, also addresses key items required in an EMS.

Application

The Materials Lab is composed of nine individual laboratory units. As discussed below, seven of the nine laboratory units and facilities and equipment management operations are addressed within this manual.

Goals

The goals of this document are as follows:

1	To provide a safe and healthful working environment by setting policies and procedures that protects workers from chemical exposures.
3	To help the Materials Lab to comply with applicable local, state, and federal waste management regulations by properly handling, transporting, storing, and disposing of regulated wastes.
4	To facilitate the operations and waste minimization efforts of the various laboratory units.
5	To train individuals and inspect work areas where hazardous materials are used.

Mission Statement

The mission statement of the Materials Lab is as follows:
"Together we support our customers and enhance construction quality by providing specialized technical expertise, materials testing, and engineering services."

Customers

The primary customer of the Materials Lab is WSDOT. Secondary customers include cities, counties, manufacturers and contractors.

Continued on next page

1.3 Introduction, Continued

Audience

The audience for this document includes:

- Laboratory Workers
- Section Supervisors
- Chemical Hygiene Officer
- Laboratory Safety Committee
- Facilities and equipment management operations staff
- Laboratory Administrative Officer
- WSDOT Maintenance and Operations Office
- WSDOT Headquarters Safety and Health Services Office (Safety and Health Services Office)
- WSDOT State Materials Engineer
- Executive-level Management

Roles and Responsibilities

Responsibility for compliance with the information in this manual rests at all levels, including the following:

Personnel	Responsibility
Executive-level Management	Has the ultimate responsibility for the safety and health of employees and must, with other executives, provide continuing support for WSDOT personnel safety and health.
WSDOT State Materials Engineer	Is responsible for the following: • Providing resources necessary to implement the requirements of the EMP. • Ensuring that managers, supervisors, and laboratory workers adhere to the guidance and provisions in this manual.
Environmental Training and Manual Coordinator	Is responsible for maintaining and updating this manual and ensuring that the laboratory personnel has the necessary training to adhere to the guidance and provisions in this manual.
Safety & Health Services Office	Has the primary responsibility for the elements of this manual that are related to the Chemical Hygiene Plan and employee safety issues.

Continued on next page

1.3 Introduction, Continued

Roles and Responsibilities (continued)

Personnel	Responsibility
Laboratory Section Supervisors	In cooperation with the Chemical Hygiene Officer and other responsible parties, is responsible for developing and implementing appropriate chemical hygiene policies and practices including, but not limited to, the following specific duties: • Responsible for the safety of all individuals in the laboratories • Monitoring procurement, use, storage, recycling, and disposal of chemicals used in the laboratories • Determining and providing the appropriate personal protective equipment and that all laboratory equipment (e.g., fume hoods, ovens, etc.) are used in accordance with manufacturer recommendations • Seeking ways to improve safety and reduce potential environmental impacts • Ensuring that laboratory personnel know where to access Material Safety Data Sheets (MSDS), and how to use them • Ensuring that laboratory personnel are appropriately trained in the use of applicable chemicals, hazardous waste disposal, and in "hazards communications – workers right to know" • Ensuring that training for working with hazardous materials has been provided as required in WAC 296-62-400 through -40027, and other substance-specific standards contained in WAC 296-62.

Continued on next page

1.3 Introduction, Continued

Roles and Responsibilities (continued)

Personnel	Responsibility
Laboratory Safety Committee	Duties and responsibilities of the Safety Committee are as follows: • Provide input to the Section Supervisors and Executive-level Management on issues related to chemical and environmental safety, and implementation of the EMP. • Arbitrate disagreements between laboratory units regarding laboratory practices.
Chemical Hygiene Officer	In cooperation with the Safety Committee and other responsible parties, is responsible for developing and implementing appropriate chemical hygiene policies and practices including, but not limited to, the following specific duties: • Monitoring the disposal of chemicals and hazardous waste in the Materials Laboratory • Seeking ways to improve the chemical hygiene program • Primary hazardous materials coordinator • Providing regular, formal chemical hygiene and housekeeping inspections, including routine inspections of emergency equipment • Maintaining material safety data sheets (MSDSs).
Laboratory Administrative Officer	Is responsible for the following: • Hazardous waste coordination and inspection • Hazardous waste training coordination • Annual hazardous waste inspection and report • Secondary hazardous materials coordinator • Document and records control • Ecology contract
Laboratory Worker	Is responsible for the following: • Performing work in a safe manner and observing established safety and hygiene practices at all times • Working safely and protecting himself/herself and other employees from possible hazardous situations • Identifying potentially hazardous conditions or changes in procedures that may constitute hazardous conditions and report these conditions to the appropriate manager • Ensuring non-laboratory personnel (other co-workers, visitors, or guests) comply with the contents of this manual.

1.3 Introduction, Continued

Documentation

This Environmental Health and Safety Manual is to be controlled and kept up to date on-line. Working paper copies will be dated but uncontrolled.

Laboratory Units Addressed

The laboratory units addressed in this Environmental Health and Safety Manual are listed below. The major operations conducted at each lab unit are also listed.

Laboratory Unit	Major Operations
Chemical Lab	Tests the following materials in conformance with the WSDOT Standard Specifications: • Cement (chemical analysis • Joint Materials • Paints • Fencing • Pavement Markers • Epoxies • Conduit • Bearing Pad Material • Pavement Marking Materials • Deicers
Liquid Asphalt Lab	Conducts testing of paving asphalt materials including, binders, emulsions, adhesives, and sealants
Bituminous Mixtures Lab	Conducts testing of asphalt concrete mixtures and verification of HMA mix designs.
Physical Testing Lab	Evaluates the quality of aggregate, concrete, cement, steel, and geotextiles used in the construction of city, county, and state roads and bridges.
Soils Lab	Conducts compaction control and stiffness tests.
Geotechnical Lab	Provides full range of geotechnical engineering and engineering geology services required to support the design, construction, and maintenance needs of the state's transportation system.
Electrical and Signing Lab	Conducts full suite of tests on each traffic controller assembly submitted to confirm quality and that the equipment meets the requirements of the WSDOT Standard Specification.
Facilities and Equipment Management Operations	Conducts facilities and equipment maintenance activities within the facility.

1.3 Introduction, Continued

Laboratory Units Not Addressed

The laboratory units and their associated activities not addressed within this Environmental Health and Safety Manual are listed below.

Laboratory Unit	Rationale for Not Including in This Document
Field Geotechnical Unit	The type of work performed by the field geotechnical unit is usually site and project specific. A document that encompasses the operations performed by this unit may be created separately.
Aerial Photography Unit	The hazardous material used by the aerial photography unit will be phased out by 2006. In addition, the chemical usage and waste generation process for this unit tends to be self-contained and discreet.
Nuclear Lab Unit	The facility used by the nuclear lab is not accessible to the rest of the laboratory work force. The operations performed by this unit are tightly regulated by the Nuclear Research Commission. In addition, the Nuclear Lab has unique requirements not applicable to the rest of the lab.

1.4 Environmental Health and Safety (EH&S) Regulatory Requirements

Background

This Environmental Health and Safety Manual addresses the environmental health & safety (EH&S) regulatory requirements that apply to Materials Lab operations.

Regulatory Requirements

The regulatory requirements that are applicable (but not limited to) to the Materials Lab are as follows:

Regulation	Regulatory Reference	Key Requirements
Dangerous Waste Requirements	Washington State Department of Ecology, WAC 173-303 and EPA, 40 CFR 260 to 280	• Hazardous waste identification • Generator requirements • Manifesting • Waste accumulation and disposal • Universal wastes • Record keeping and reporting • Emergency preparedness • Training program • Land disposal restriction notices
Hazardous Waste Transportation and Disposal	Federal Department of Transportation, 49 CFR 172, 173, 178 and 179	• Packaging • Labeling and marking • Manifesting • Hazardous materials (HazMat) employee training
Occupational Exposure to Hazardous Chemicals in Laboratories	State and Federal Labor and Industries WAC 296-62-400 and 29 CFR 1910	• Prepare chemical hygiene plan • Designate a Chemical Hygiene Officer • MSDSs available to employees • Employee training • Develop standard operating procedures • Provision and use of personal protective equipment (PPE) and engineering controls • Medical surveillance • Labeling and marking • Proper emergency planning.
International Fire Code (IFC)	IFC Section 2701.5	The IFC requires that a facility prepare a HMMP in accordance with IFC Section 2701.5.1, when requested by the fire code official.

Chapter 2 Facility Information

2.1 Overview

Introduction This chapter contains the facility information for the Materials Lab.

Contents This section contains the following topics:

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2.2 Facility Operations Information

Facility Name	Washington State Department of Transportation Materials Laboratory (Materials Lab)
Physical Address	1655 South Second Avenue Tumwater, Washington 98512
Mailing Address	P.O. Box 47365 Tumwater, WA 98504-7365
Phone Numbers	Telephone: (360) 709-5400 Fax Number: (360) 709-5588
Property Owner and Contact Information	Washington State Department of Transportation Contact: R. Ralph Mays Address: P.O. Box 473228, Olympia, Washington 98504-7328 Telephone: (360) 705-7351
Principal Business Activities	Materials Testing and Geographic Services **Note:** Activities performed by the Aerial Photography Unit, Nuclear Lab Unit, and Field Geotechnical Unit are not covered in this manual.
Number of Employees	Approximately 125 (not including Aerial Photography Unit)
Normal Hours of Operation	6:30 a.m. to 5:00 p.m.
SIC and NAICS	The Standard Industrial Classification (SIC) and the corresponding North American Industrial Classification System (NAICS) are listed as follows:

Continued on next page

2.2 Facility Operations Information, Continued

	SIC	NAICS
Primary	8711	926120 Regulation and Administration of Transportation Programs 541330 (Engineering Services)
Secondary	8734	541380 (Testing Laboratories)
Other	8713	541370 (Surveying and Mapping Services, except Geophysical Services)

Special Land Uses

The Materials Lab is located in the Commercial Development (CD) zoning district with an Aquifer Protection Overlay zone and is permitted as an "accessory" use.

2.3 Facility Contact Information

Hazardous Materials Coordinators

The primary and secondary hazardous materials coordinators are listed below:

Coordinator	Name and Contact Information
Primary	**Name:** Jeanne Andreasson **Title:** Chemical Hygiene Officer, Chemical Lab Section Supervisor Telephone: (360) 709-5431 Cell Phone: (360) 701-5309
Secondary	**Name:** Steve Strauss **Title:** Facilities and Equipment Management Operations Supervisor Telephone: (360) 709-5490 Cell Phone: (360) 480-7164

Facility Contact

The primary and secondary facility contacts are listed below:

Coordinator	Name and Contact Information
Primary	**Name:** Steve Strauss **Title:** Administrative Officer Telephone: (360) 709-5490 Cell Phone: (360) 480-7164
Secondary	**Name:** John Grady **Title:** Facilities and Equipment Management Operations Supervisor Telephone: (360) 709-5495 Cell Phone: ((360) 412-7706

Continued on next page

2.3 Facility Contact Information, Continued

Declaration

Must be signed by Primary Facility Contact or authorized designated facility representative.

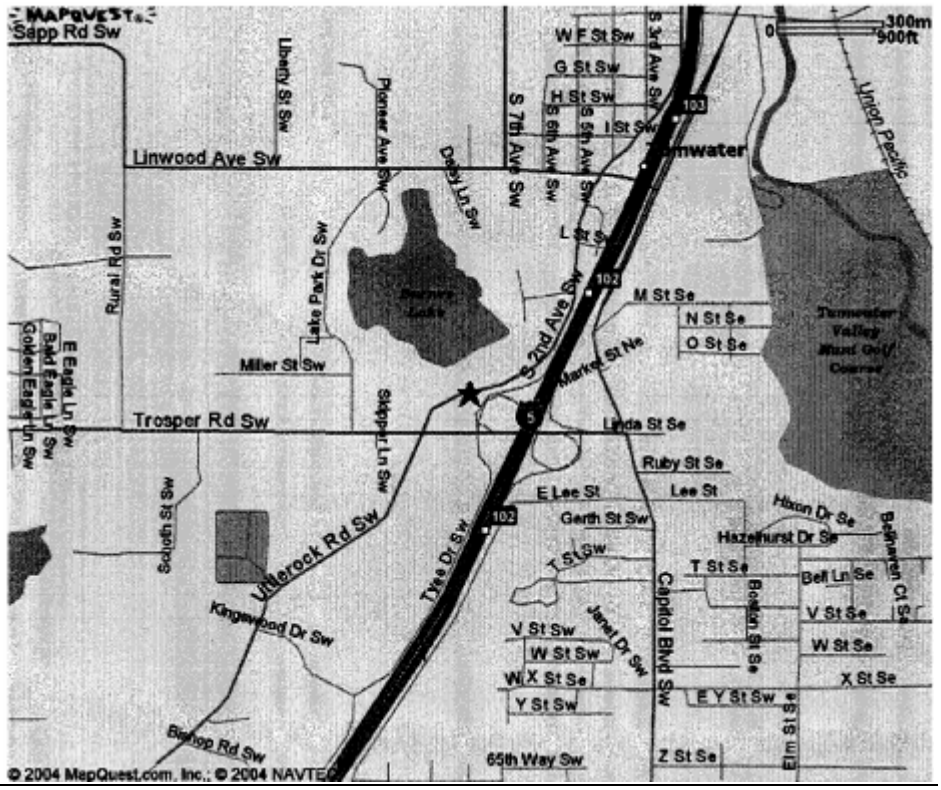
I certify that the <u>following</u> information is true and correct to the best of my knowledge.

Print Name	John Grady
Title	Facilities and Equipment Management Operations Supervisor
Signature	
Date	

2.4 Facility Location and Layout

Vicinity Map

The Materials Lab is located on South Second Avenue in Tumwater, Washington, just east of the Trosper Road Exit (Exit 102) off Interstate 5. A vicinity map is shown below.



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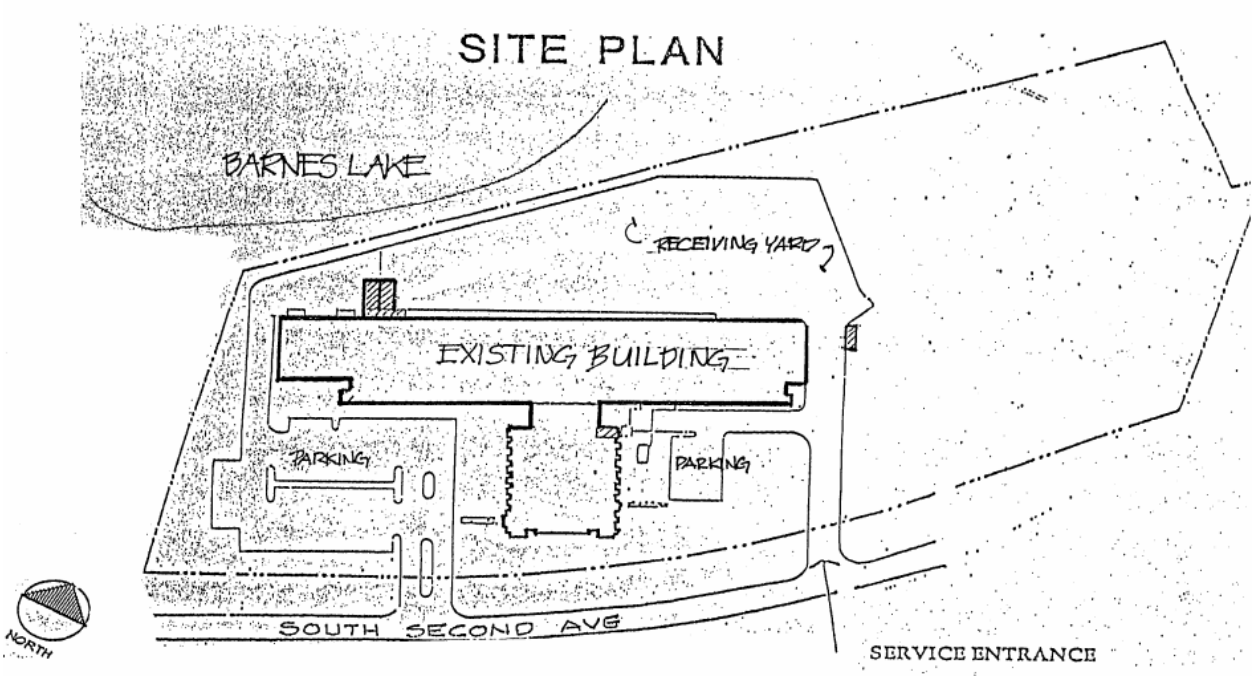
2.4 Facility Location and Layout, Continued

Site Plan

The individual lab units are located on the first floor of the Materials Lab building. The floor plan is shown below.



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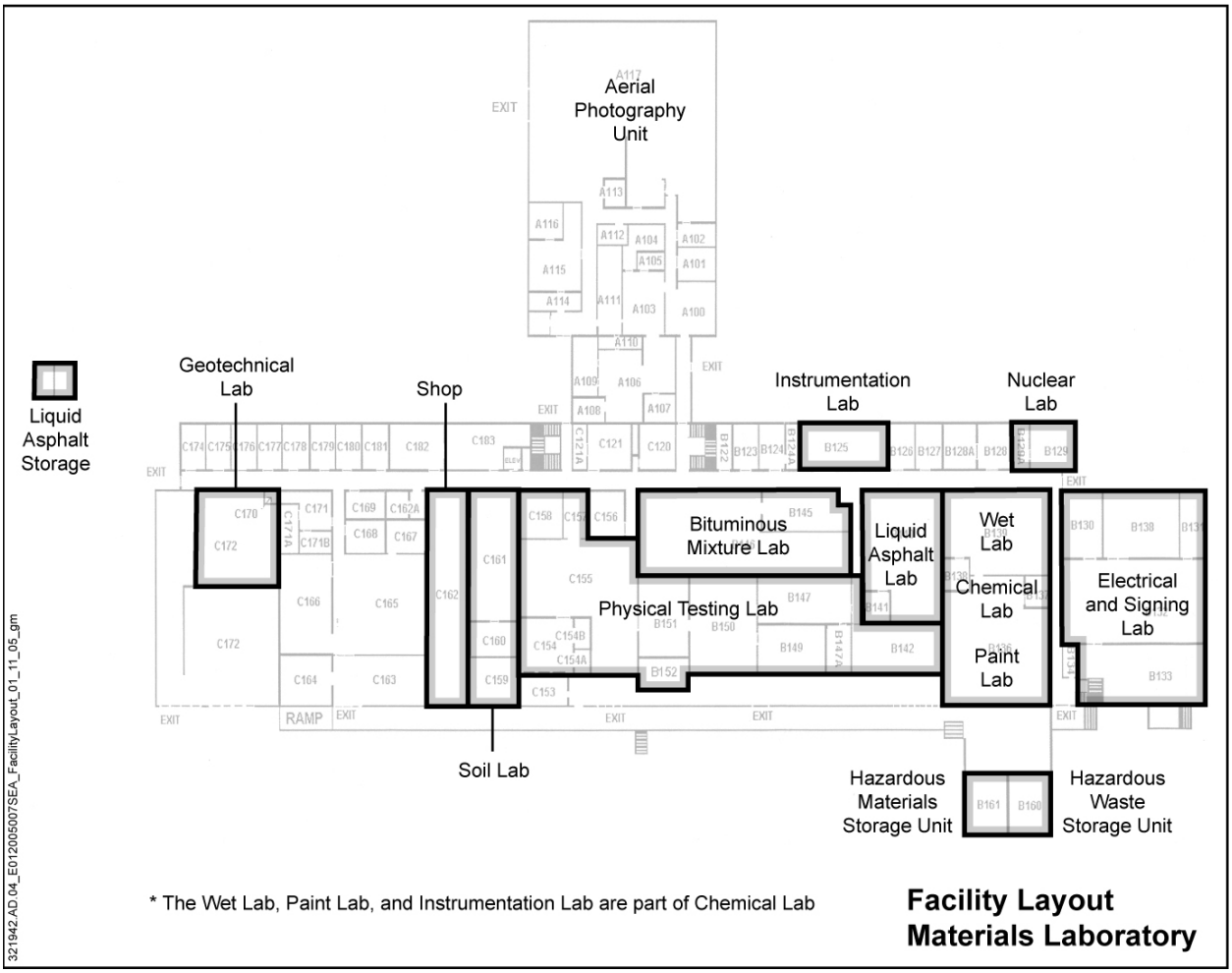
2.4 Facility Location and Layout, Continued

Facility Layout The layout of the facility, indicating where each lab unit and the hazardous material and hazardous waste storage units are located, is shown below.



Chapter 3 Operations-based Environmental Health and Safety Procedures

3.1 Overview

Introduction

This chapter of the manual addresses environmental health & safety (EH&S) requirements that are driven by specific business processes and operations rather than being "facility-related." Each EH&S process will be described individually.

Contents

This chapter contains the following topics:

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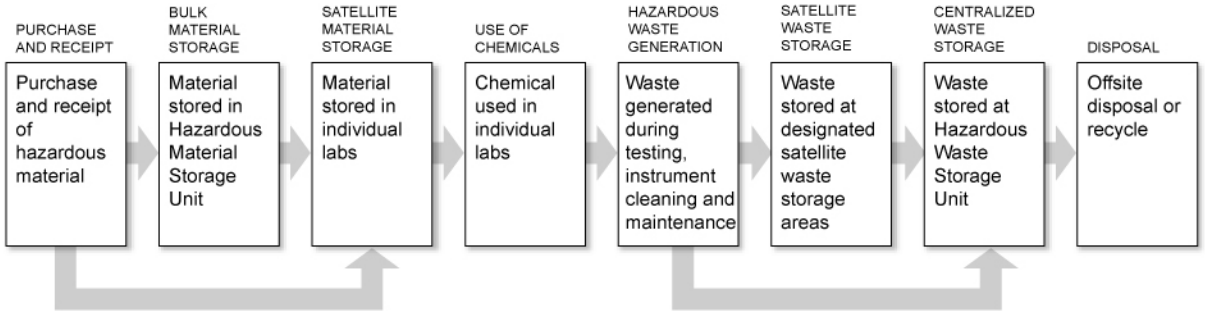
3.2 Scope and Discussion

Background

Management of hazardous chemicals requires a “cradle to grave” approach. This philosophy also ensures compliance with numerous Washington Industrial Safety and Health Administration (WISHA), Washington State Department of Ecology (Ecology), and U.S. Environmental Protection Agency (EPA) regulations. The following section applies to the management of hazardous materials within the Materials Lab.

Activities Involving Handling of Hazardous Material

The laboratory activities involving handling of hazardous material are shown in the following flow diagram:



Activities Involving Handling of Hazardous Material

Management Principles

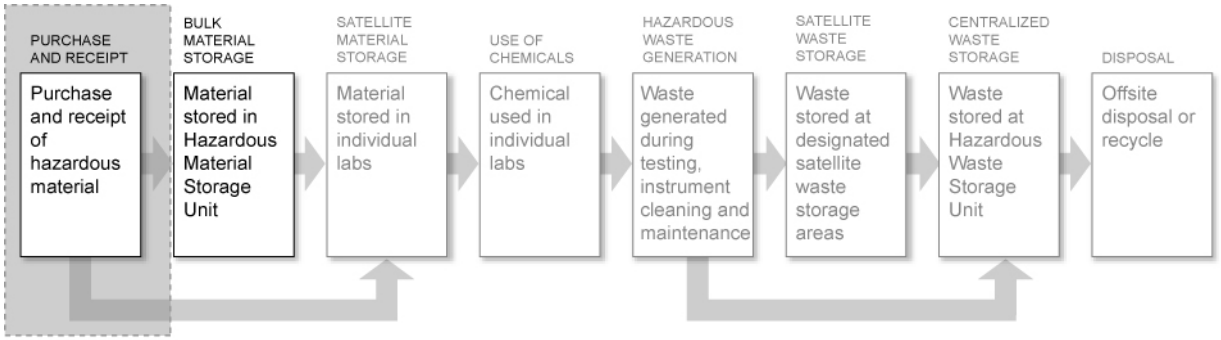
Effective management involves a clear understanding of the goals and end-result. Several goals for the management of chemicals at the Materials Laboratory should be followed:

- **Safety Is The Highest Priority.** Take the necessary precautions to reach goals of achieving zero accidents/injuries and chemical exposures
- **Do Not Underestimate Risks.** Ensure that the risk associated with each chemical is assessed, understood, and communicated. It is prudent to assume all chemicals are hazardous and handle them accordingly.
- **Use Proper Control Measures.** Eliminate the hazard through engineering controls, PPE, and administrative procedures. All staff should be properly trained in accordance with regulatory requirements so they can work safely at their jobs.
- **Waste Reduction.** Reduce wastes through recycling, re-use and the use of alternative, less toxic/hazardous chemicals.

3.3 Purchasing and Receiving of Hazardous Material

Hazardous Material Handling Activity

The activities involving the handling of chemicals and hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Purpose

To establish chemical and hazardous materials procurement, receipt, and distribution procedures that will ensure the safety and health of personnel and the environment.

Application

This procedure applies to all staff who purchase, receive, and distribute chemicals/hazardous materials that will be used at the Materials Lab.

Policy

The use of chemicals creates a variety of environmental and safety issues. These issues must be evaluated prior to the procurement of chemicals and thereby avoid, to the extent feasible, adverse consequences.

Procedure

The following steps are to be followed during the procurement, receipt, and distribution of chemicals:

Step	Action	
1	**New or non-routinely used chemical**	Review the MSDS and other documents to assess the environmental health & safety hazards. Then obtain prior approval from Section Supervisor.
	Routinely used chemicals	Check the Chemical Inventory Database (Appendix 3) prior to initiation of a purchase requisition.

Continued on next page

3.3 Purchasing and Receiving of Hazardous Material Continued

Procedure
(continued)

Step	Action
2	Contact chemical supplier and complete appropriate paper work, online or otherwise.
3	Complete and submit requisition form to the Supply Officer.
4	When chemical is received, contact the initiator of the order as soon as practical. The initiator of the order will be responsible for the proper storage of the chemical. **Note:** No container should be accepted without an adequate identifying label that includes identity of chemical, appropriate hazard warnings, and manufacturer's name and address. No container should be accepted without an MSDS or without an MSDS on file. **Note:** All chemicals should be received only by personnel trained in the physical handling and emergency procedures to follow for hazardous chemicals during unloading, storage, and transport.
5	The initiator of the order must complete the Incoming Chemical Data Sheet (see Appendix 1) and enter the information into the Chemical Inventory Database (Appendix 2).

Responsibilities of Section Supervisors

The responsibilities of the Section Supervisors are as follows:

Step	Action
1	Review the requisition to ensure that environmental health and safety considerations have been addressed. Consult with the Chemical Hygiene Officer as necessary.
2	Maintain the Chemical Inventory Database.
3	Maintain and update the MSDS file for their Section.

Continued on next page

3.3 Purchasing and Receiving of Hazardous Material, Continued

Procurement Guidelines

Hazardous waste reduction begins at the source of generation. Purchases should be reviewed with the goal of reducing the quantity and hazard of the waste produced whenever possible. Some guidelines are presented below for that purpose.

- Purchase only the quantity of material necessary for the job at hand. Excess material and material that ages past its shelf life become hazardous waste.
- Determine if a less hazardous material can be substituted for the same job. Suppliers often have suggestions for safer or more environmentally friendly products.
- Determine if a reusable or recyclable material can be used for the same job.
- Review the MSDS for chemical occupational hazards.

Note: The Chemical Hygiene Officer must give prior approval whenever extremely hazardous chemicals are to be used in the laboratory or hazardous chemicals are used for the first time.

Training

Personnel who receive and distribute chemicals should be trained in the physical handling and emergency procedures to follow for hazardous chemicals during unloading, storage, and transport.

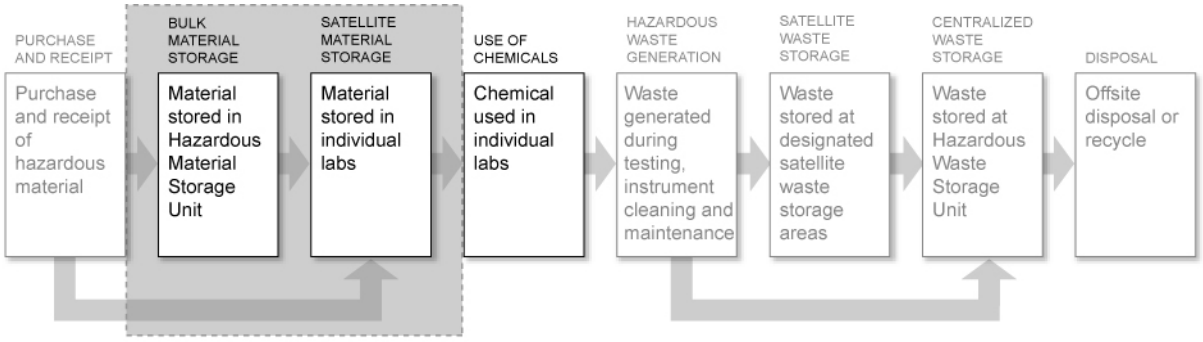
Records

- Chemical Inventory Database
- Hazardous Materials Requisitions
- Incoming Chemical Data Sheet
- Material Safety Data Sheets (MSDS)

3.4 General Chemical Storage Requirements and Guidelines

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Purpose

This section covers chemical storage requirements and guidelines. Storage of chemicals in the bulk storage and satellite storage areas is discussed in a separate section.

Application

This section applies to all units that use or store hazardous material.

Policy

Chemicals should only be stored in designated storage locations.
Minimize the number of locations where chemicals are stored.
Keep the amount of chemicals stored in the laboratory to a minimum.

Continued on next page

3.4 General Chemical Storage Requirements and Guidelines, Continued

Chemical Storage Guidelines

General storage guidelines are listed below:

	Guidelines
1	***Store all chemicals by their hazard class and not in strict alphabetical order.*** Storing chemicals in alphabetical order will often result in incompatible chemicals being stored next to one another. Instead, segregate chemicals into groups according to their hazards; for example, store acids with acids, bases with bases, flammables with flammables, toxins with toxins, reactives with reactives, and oxidizers with oxidizers. Within these groups, chemicals can be stored in alphabetical order to facilitate locating them. If a chemical exhibits more than one hazard, use the highest hazard(s) to segregate it. A chemical segregation and incompatibility chart is presented in Appendix 3.
2	***Do not store chemicals near heat sources such as ovens or steam pipes. Also, do not store chemicals in direct sunlight.***
3	***Date and initial chemicals when received and opened.*** This will assist you in using the oldest chemicals first, which will also decrease the amount of chemicals for disposal. If a particular chemical becomes unsafe upon storage (for example, diethyl ether), then an expiration date should also be included. Keep in mind that expiration dates set by the manufacturer indicate the shelf life of the unopened container, and do not necessarily imply that the chemical is safe to use up to that date after it has been opened.
4	***Do not use lab benches as permanent storage for chemicals.*** In these locations the chemicals can be easily knocked over, incompatible chemicals can be stored next to one another, and the chemicals are unprotected from a fire situation. Each chemical should have a designated storage location and should be put there after use.
5	***All chemicals must be clearly labeled (labeling is discussed in Chapter 4.4 General Laboratory Safety). Inspect your chemicals routinely for any signs of deterioration and for the integrity of the label.*** Another benefit of labeling is that unknown chemicals cannot be shipped as chemical waste until an expensive analysis has been performed to identify them. Everything should be done to prevent chemicals from becoming unknowns.

Continued on next page

3.4 General Chemical Storage Requirements and Guidelines, Continued

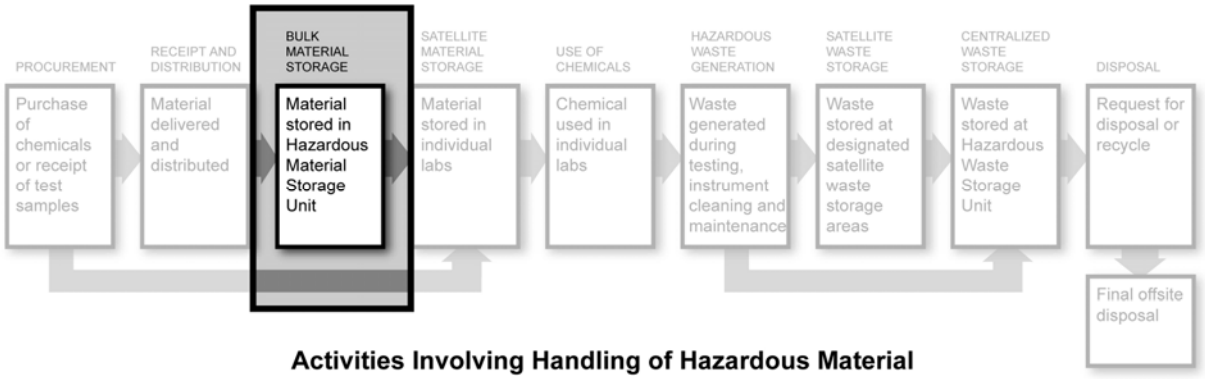
Chemical Storage Guidelines (continued)

	Guidelines
6	***Do not store chemicals on the floor, especially chemicals in glass containers.*** It is too easy for containers to be knocked over, bumped into, or hit with a chair.
7	***Do not use fume hoods as a permanent storage location for chemicals, with the exception of particularly odorous chemicals that may require ventilation.*** The more containers, boxes, equipment and other items that are stored in a fume hood, the greater the likelihood of chemical vapors being drawn back into the room. Some chemical fume hoods have ventilated storage cabinets underneath, and this is a good place to put chemicals that require ventilation.
8	***Promptly contact the Chemical Hygiene Officer for the disposal of any old, outdated, or unused chemicals.***
9	***Do not store excessive amounts of chemicals in a lab.*** Buying chemicals in bulk quantities has more disadvantages than advantages: limited work space, creation of a serious fire hazard, and disposal costs of unused chemicals that are often higher than the initial purchase costs.

3.5 Chemical Storage and Retrieval at Hazardous Material Storage Unit (B161)

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Bulk Storage at Hazardous Material Storage Unit

The Hazardous Material Storage Unit (B161) is one of the two hazardous materials/dangerous waste storage units located at the west end of the loading dock outside of the main building. B161 is the western-most of the two units. The other unit (B160) is used for storage of hazardous waste.

Construction of Storage Unit

The 12’ x 15’ storage unit is constructed on a raised foundation. It is equipped with explosion panel, 1-1/2 hour Curtain Fire Dampers with backdraft damper, mechanical vent, explosion-proof fixtures, and dry chemical fire extinguishing systems.

Security and Access Control

The Hazardous Material Storage Unit has limited access. Ask a lab supervisor when storage unit needs to be accessed.

Continued on next page

3.5 Chemical Storage and Retrieval at Hazardous Material Storage Unit (B161), Continued

Spill Containment Features

The floor of the storage unit is equipped with 10-gauge steel grated decking throughout the width of the room. Accidental spills would be contained within the storage unit. It is designed to safely contain spills of up to 25 percent of the total storage capacity.

Chemical Material Storage

Bulk chemicals are stored within this unit; typically, the following:

Chemicals	Type of Container
Excel	55-gallon metal or 30 gallon Poly Drums
Acetone	4-L Glass container
Alcohol, Reagent	4-L Glass container
Xylenes	4-L Glass container
Trichloroethylene	4-L Glass container or drum
Toluene	4-L Glass container
Sulfuric Acid	4-L Glass container
Hydrochloric Acid	4-L Glass container
Nitric Acid	4-L Glass container

Chemical Retrieval Procedures

The following procedures should be adhered to when retrieving chemicals from the Hazardous Material Storage Unit:

Step	Action
1	Verify that existing inventory stored in the satellite storage area has been exhausted.
2	Depending on type of chemicals being retrieved, ensure you have proper PPE and transporting device such as nitrile gloves, respirator, jug carrier, carts, etc.
3	Use care when transferring chemicals from bulk containers into smaller containers.
4	Close the containers tightly. Place the bulk container back in its appropriate location.
5	Note the date, type of chemical, and quantity you have removed on the log sheet located near the entrance.
6	Secure Hazardous Material Storage Unit.

Continued on next page

3.5 Chemical Storage and Retrieval at Hazardous Material Storage Unit (B161), Continued

Training

All laboratory workers should be trained in the proper procedures for chemical storage and retrieval at the Hazardous Material Storage Unit.

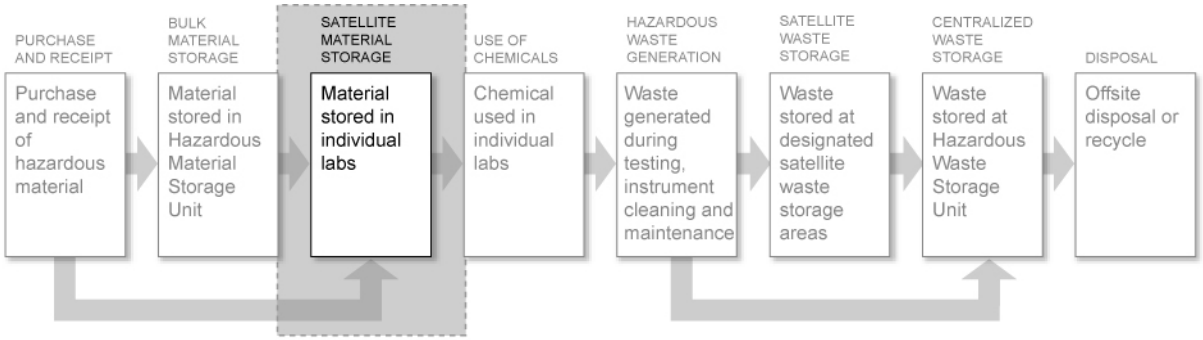
Records

- Hazardous Material Storage Unit Log Sheet (See Appendix 11)

3.6 Chemical Storage at Satellite Storage Areas

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Satellite Storage Locations

Each laboratory should have designated storage areas for all chemicals routinely used. Chemicals stored in this area should be segregated on the basis of chemical compatibility (See Appendix 3).
For example, all flammable solvents should be stored in a Flammable Liquid Storage Cabinet away from potential heat sources. Strong acids and bases should be separated into different cabinets or compartments.
After each use, the chemicals should be returned to this area and not stored on bench tops or in fume hoods.

Chemical Inventory

The inventories of the chemicals stored in the satellite storage areas are Satellite Hazardous Material and Waste Storage Area Inspection Form in the Chemical Inventory Database (See Appendix 2). The amounts stored in laboratory areas should be kept to a minimum and inventoried at least annually during the Annual Chemical Inventory check by the Section Supervisor or designee (see Chapter 5.6 Chemical Inventory Management). Outdated chemicals or chemicals that are no longer needed should be disposed of as soon as possible.

Continued on next page

3.6 Chemical Storage at Satellite Storage Areas, Continued

Secondary Containment

Secondary containment is required in circumstances where there is a possibility that the chemicals may spill and contaminate the area. This containment can be achieved in a variety of ways, such as:

- Use of chemical-resistant trays, or other containers, placed under the chemical container
- Use of storage cabinets that are designed to contain spilled chemicals.

Chemicals such as acetone and Excel Clean HD that are stored in plastic carboys with spigots for dispensing should be positioned with the spigot over a tray (secondary container) large enough to contain the entire contents of the carboy in the event of leakage from the spigot.

Labeling

All containers used to store chemicals, regardless of their construction type, must be labeled with appropriate National Fire Protection Association (NFPA) labels (see Chapter 4.13 NFPA Hazard Codes).

Exceptions: Exceptions to this guideline are beakers and glassware used in an immediate laboratory determination. It is advised that all glassware be clearly labeled as to chemical content during any phase of a determination.

Training

Laboratory workers should be trained in proper labeling and chemical storage procedures.

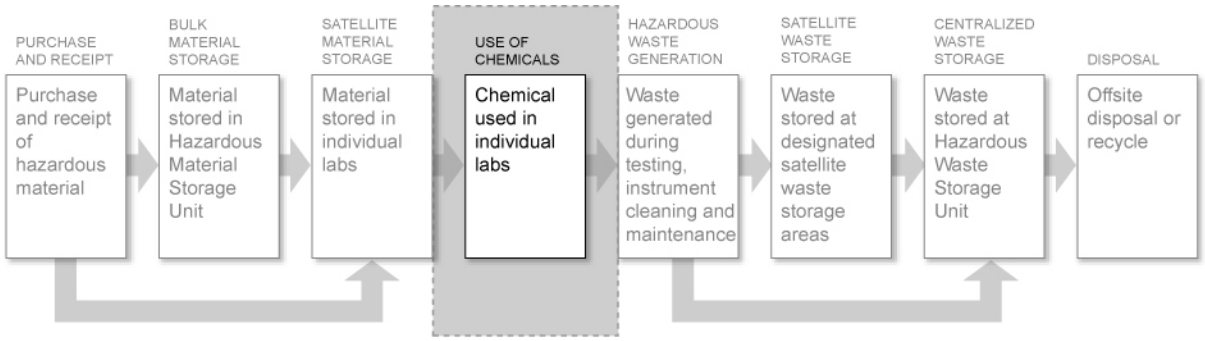
Records

Chemical Inventory

3.7 Chemical Usage Hazards and Control

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Categories of Chemicals

To simplify the discussion of safety considerations for use of particular chemicals that are found in the Materials Lab, seven categories have been developed. These include:

- Flammables
- Oxidizers
- Corrosives
- Reactives
- Toxins
- Compressed Gas
- Carcinogens

Most laboratory chemicals will fall within one of these seven groups. Of course, many chemicals can fit into more than one category and in this case a decision would have to be made as to what is the most important characteristic of that chemical.

For example, methanol does have toxic properties, but for the purpose of storage it should be stored with other flammables. In general, chemicals within these categories will react similarly and will have similar properties. Being aware of the properties and characteristics of these general chemical categories will aid in the proper storage, handling, and use of chemicals. In addition to the five categories discussed above, additional requirements are applicable to the use of carcinogens. Commonly used chemicals at the Materials Lab are categorized in the following table.

Continued on next page

3.7 Chemical Usage Hazards and Control, Continued

Categories of Chemicals (continued)

Category	Chemicals
Flammables	• Excel Clean HD (Citrus Cleaner) • Acetone • Toluene • Ethyl ether • Paints • Petroleum ether • Alcohol • Methyl Ethyl Ketone
Oxidizers	• Peroxides • Nitrates • Nitrites • Perchloric acid (see Perchloric Acid Chemical Handling Sheet in Appendix 5) • Chlorates • Chlorite • Hypochlorite • Dichromate • Permanganate • Persulfate
Corrosives	• Sodium Hydroxide • Potassium Hydroxide • Hydrochloric Acid • Sulfuric Acid • Nitric Acid • Phosphoric Acid • Acetic Acid • Hydrofluoric Acid (see Hydrofluoric Acid Chemical Handling Sheet in Appendix 5)
Reactives	• Perchloric Acid
Toxins	• Hydrofluoric Acid • Mercury

Continued on next page

3.7 Chemical Usage Hazards and Control, Continued

Categories of Chemicals (continued)

Category	Chemicals
Compressed Gas	• Argon • Oxygen • Helium • Air • Nitrogen • Acetylene • Gold Gas (a mixture of CO2 and Argon)
Confirmed or Suspected Carcinogens	• Inorganic arsenic • Lead • Benzene • Formaldehyde

Chemical Hazards and Safety Considerations

The general characteristics, use and storage guidelines, health hazards, first aid, and personal protective equipment requirements for each of the categories of chemicals are included in Appendix 4. Refer to MSDSs for information about specific chemicals.

Training

Lab personnel who handle chemicals should be familiar with the general characteristics, use and storage guidelines, PPE requirements, and health hazards associated with the chemicals they work with on a routine basis. On-the-job training will be conducted on specific tasks involving the use of chemicals.

Records

MSDSs

3.8 Instrument and Lab Container Cleaning

Background

Because of the nature of the material tested at the lab, the instruments and lab containers must be cleaned properly. The proper cleaning procedures are presented in this section.

Application

This section is applicable to the following labs that conduct cleaning of instruments and containers:

- Liquid Asphalt Lab
- Chemical Materials Lab
- Bituminous Mixtures Lab
- Physical Testing Lab

Policy

Minimize the quantity, volume, and toxicity of chemicals used to clean instruments and lab containers.

Type of Cleaning Operations and Chemicals Used

The type of cleaning operations involving the use of hazardous materials are listed in the following table:

Cleaning Operations	Location	Chemicals/Equipment Used
Viscometer Covered with Asphalt	Liquid Asphalt Lab	Excel Clean HD and Acetone
Glassware with Asphalt	Liquid Asphalt Lab	Pyro-Clean Oven
Tools used to handle Asphalt	Liquid Asphalt Lab Bituminous Lab	Excel and Acetone
Glassware with chemicals	Chemical Lab and Physical Testing Lab	Detergent and water
All surfaces in the Moisture Room	Moisture Room (Part of Physical Testing Lab)	Chlorine Bleach

Continued on next page

3.8 Instrument and Lab Container Cleaning, Continued

Procedure for Cleaning the Saybolt Viscometer

The procedure for cleaning the Saybolt Viscometer is as follows:

Step	Action
1	Don PPE, including rubber gloves.
2	Flush the viscometer with Excel Clean HD until the liquid that comes out runs clear.
3	Flush the Viscometer with water.
3	Wipe down the surfaces of the Viscometer using Excel Clean HD if needed.
4	Rinse with acetone to remove the residual material if needed.

Procedure for Cleaning Tools Fouled with Asphalt

The procedure for cleaning tools is as follows:

Step	Action
1	Don PPE, including rubber gloves.
2	Dip the tools in Excel Clean HD bath.
3	Soak the tools overnight if necessary. Be sure the lid is closed.
4	Remove the tools and spray with acetone to remove the residual.
5	Dispose of the Excel Clean HD bath on a weekly basis or every other day (during high usage times) by taking the bath out to the Bulk Hazardous Waste Storage Unit. See Waste Handling Sheet for Excel Clean HD in Appendix 6.

Procedure for Cleaning Glassware Fouled with Asphalt

Glassware used for handling asphalt at the Liquid Asphalt Lab is cleaned using a thermal cleaning system (Pyro-Clean Oven). The Pyro-Clean Oven eliminates the labor and safety hazards associated with common solvent methods used for cleaning laboratory glassware and metal parts. The procedure for operating the Pyro-Clean Oven is as follows:

Step	Action
1	Place dirty glassware in the oven.
2	Make sure the settings are correct. Press start.

Continued on next page

3.8 Instrument and Lab Container Cleaning, Continued

Procedure for Cleaning Glassware Fouled with Asphalt (continued)

Step	Action
3	Oven temperature is raised to about 900°F to pyrolyze the organic contaminants. Pyrolysis is carried out safely under an oxygen-depleted atmosphere, leaving only carbonized residues on the glassware and parts.
4	After glassware is removed from the oven it is cleaned with soap and water.
5	The ash is vacuumed out using a ShopVac and is disposed as solid waste.

Procedure for Cleaning Moisture Room

The Moisture Room is maintained by the Physical Testing Laboratory. It is cleaned on a monthly basis. The procedure for cleaning the Moisture Room is as follows:

Step	Action
1	Gather supplies for cleaning the Moisture Room. These include: • Bleach • Brushes • PPE (see Step 3)
2	Make up bleach cleaning spray solution using 1 part water and 1 part bleach.
3	Don PPE, including the following: • Respirator • Rubber gloves • Rubber boots • Apron • Full face shield
4	Spray all surfaces with bleach solution.
5	Rinse with pressure washer.

Training

On-the-job training will be conducted for employees who will be performing cleaning procedures.

3.9 Standard Operating Procedure: Acid Neutralization

Application

This procedure applies to the Chemistry Lab.

Procedure for Neutralizing Acidic Solutions in Acid Sink

The Wet Lab (part of the Chemistry Lab) is equipped with an Acid Sink designed to allow acidic solutions to be first neutralized prior to discharge into the sewer. The procedure for neutralizing acidic solutions in the Acid Sink is as follows:

Note: Acidic solutions containing high metals content should NOT be discharged into the Acid Sink. Instead, it should be collected in a properly labeled acid waste solution container (see WHS in Appendix 6).

Step	Action
1	Don appropriate PPE, including eye goggles and acid-resistant gloves.
2	Pour the acidic solution slowly down the Acid Sink.
3	Rinse the sink with a generous amount of water.
4	Monitor the pH meter readout located on the counter.
5	If pH falls below 5, stop operations. Contact the Section Supervisor because this may indicate that the limestone in the Acid Sink that provides the neutralization needs to be replenished.

Calibration of pH Meter

To ensure that the in-line pH meter is functioning properly, the meter should be calibrated on a quarterly basis, at a minimum.

Training

On-the-job training will be conducted for employees who will be performing the acid neutralization.

Records

The pH meter calibration records should be kept on file for at least 3 years.

3.10 Standard Operating Procedure: Treatment of Polymer Resin Waste

Application

This procedure applies to the Chemistry Lab.

Procedure for Onsite Treatment of Polymer Resin Waste

The Chemistry Lab is responsible for conducting testing for polymer resin samples (including epoxy, polyester, and acrylic). Once the testing is complete, as determined by the Section Supervisor, the samples will be placed in the area of the Chemistry Lab labeled "Polymer Samples – Ready for Disposal." These samples have to be treated onsite prior to disposal as solid waste. The following is the Standard Operating Procedure for Onsite Treatment of Polymer Resin Waste Epoxies (Polymer Resins).

Step	Action
1	Obtain and review all MSDSs pertaining to the resin system(s) to be disposed of.
2	Obtain and review the technical data sheets for the resin system(s) to be disposed of. Note any special precautions necessary. Note the required mix ratio (epoxy), or catalyst dosage (polyester and acrylic).
3	Eye protection, chemical-resistant gloves, and protective clothing shall be worn when preparing resins. Resins shall only be mixed under conditions providing adequate ventilation.
4	Obtain the "Polymer Disposal Log" clipboard and fill in "Disposal Date," "Preparer," "Lab ID#," "Material Type," "Brand," and "Mix Ratio."
5	Mix each individual component separately as described in the technical data sheets that accompany the polymer.
6	Weigh or otherwise measure each component and note the weight or measurement on the "Polymer Disposal Log."
7	Mix the appropriate quantities of components together as required by the mix ratio or catalyst dose as described in the technical data sheets. Any excess component shall be labeled as "Excess Component" and shall be identified by Lab ID and Material Type. Excess components shall be identified as either hazardous or non-hazardous and shall be disposed of accordingly
8	When reacted polymer resins have cured and cooled to room temperature, they shall be inspected by authorized Chemistry Section personnel. Reacted polymer shall either be approved for disposal as regular waste or, in the case of insufficiently or defectively cured product, shall be designated as hazardous waste and disposed of accordingly. The method of disposal (regular or hazardous) shall be noted on the "Disposal Log" along with the authorizer's initials.

Continued on next page

3.10 Standard Operating Procedure: Treatment of Polymer Resin Waste, Continued

Procedure for Onsite Treatment of Polymer Resin Waste (continued)

Step	Action
9	Polymer Disposal Log sheets shall be sent monthly to the Chemical Hygiene Officer.

Training

On-the-job training will be conducted for employees who will be performing the treatment of polymer resin waste.

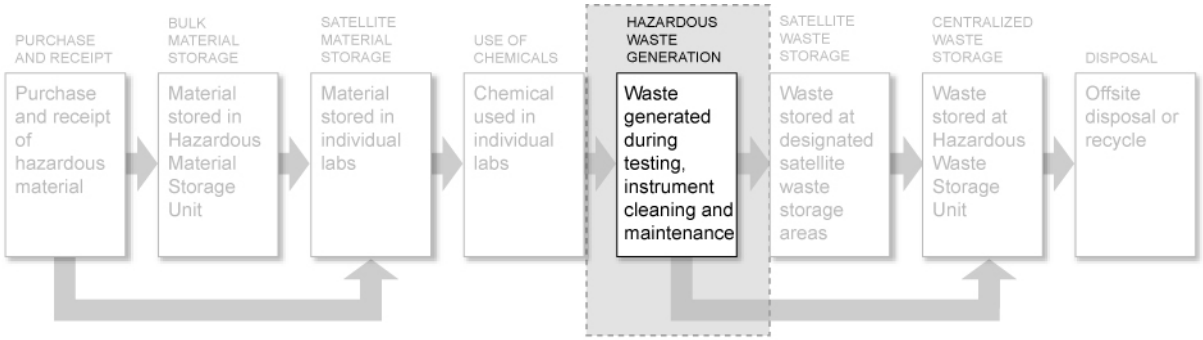
Record

Polymer Disposal Log

3.11 Overview of Hazardous Waste Generator Requirements

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Purpose

Managing the generation and disposal of hazardous waste is one of the more difficult environmental management challenges for staff in many laboratories. This section presents an overview of hazardous waste generator requirements. More specific information, such as hazardous waste identification, handling and accumulation, and disposal are presented in separate sections.

Application and Responsibility

Hazardous wastes are generated by all the laboratory units. Individuals within the units are responsible for the proper identification, accumulation, and disposal of the waste within the laboratory unit. The Chemical Hygiene Officer is responsible for the overall proper classification, accumulation, disposal, and recordkeeping of the hazardous waste at the Materials Lab.

Definitions

Hazardous waste is a solid, liquid, or gaseous material with certain properties that could pose dangers to human health or the environment. Types of hazardous wastes include certain listed wastes, as well as wastes that exhibit the characteristics of ignitability, corrosivity, reactivity or toxicity.

Policy

Efforts will be taken to assure that waste laboratory chemicals will not harm people or the environment. All hazardous wastes will be disposed of properly in accordance with state, local, and federal laws. Efforts will be taken to continuously identify opportunities to minimize or prevent generation of hazardous waste.

Continued on next page

3.11 Overview of Hazardous Waste Generator Requirements,
Continued

Applicable Regulations

As a generator of hazardous waste, the Materials Lab is subject to Resource Conservation and Recovery Act (RCRA) hazardous waste management regulations (40 CFR Parts 260 to 270). These regulations include requirements governing waste classification, accumulation, disposal, recordkeeping, and emergency preparedness. EPA has delegated authority to the states to implement and enforce hazardous waste management. In the State of Washington, generators of hazardous waste are subject to Washington's Dangerous Waste Regulations (Chapter 173-303 WAC).

Generator Requirement Overview

Hazardous waste management requirements are dependent on the type and quantity of wastes the lab generates. In order to properly manage hazardous waste, the lab must identify and inventory its waste streams, characterize these wastes, and then determine and track its waste generator status. The following 10-step checklist summarizes the responsibilities of a hazardous waste generator. Each of the ten steps is further expanded below.

Stage	Description
1	Identify your waste and generator requirements: • The types of wastes generated at the Materials Lab are identified in the section on Types of Wastes Generated. • Generator requirements are dependent on the quantities of waste generated.
2	Obtain a RCRA site identification number. (This is a one time-event that has already been done.)
3	Report annually. A Dangerous Waste Annual Report must be submitted to Ecology by March 1 of each year.
4	Perform preventive maintenance. The facility should be designed, constructed, maintained and operated in a manner that reduces the possibility of a hazardous waste accident. Establish a written schedule for regular inspections of all monitoring equipment, safety and emergency equipment security devices, and operating and structural equipment.

Continued on next page

3.11 Overview of Hazardous Waste Generator Requirements, Continued

Generator Requirement Overview (continued)

<table>
<tr><th>Stage</th><th>Description</th></tr>
<tr><td>5</td><td>Properly accumulate hazardous waste:
• All containers must be marked with the words “hazardous or dangerous waste,” an easily understood description of the waste, the date the waste was first placed in the container, and the hazards associated with the waste.
• Establish satellite accumulation areas, if necessary. A satellite accumulation area is a location at or near any point of generation of hazardous waste where:
- The waste is initially accumulated (up to 55 gallons)
- There is someone monitoring the area.

To avoid the need for a storage permit, ship Materials Lab waste to a facility that has a dangerous waste permit.
<table>
<tr><th>Annual Quantity of Waste Generated</th><th>Number of Days Within Which Waste Must be Transported Offsite</th></tr>
<tr><td>If the Materials Lab generates more than 220 pounds (per month) and accumulates less than 2,200 pounds of hazardous waste on site</td><td>Within 180 days of the date the waste was first placed in a container</td></tr>
<tr><td>If the Materials Lab generates more than 2,200 pounds (per month)</td><td>Within 90 days of the date the waste was first placed in a container</td></tr>
</table>

Note: Currently the Materials Lab generates more than 220 pounds and less than 2,200 pounds of hazardous waste on a monthly basis and is considered a Medium Quantity Generator (MQG). Therefore, the wastes accumulated in the Hazardous Waste Storage Unit should be shipped within 180 days of the date the waste was first placed in the Hazardous Waste Storage Unit.

If the Mats Lab generates more than 2,200 pounds of hazardous waste in a month, it will become a Large Quantity Generator, and additional requirements will apply (e.g., Training Plan, Emergency Response Plan, shorter timeframe for filing exception reports, etc.).</td></tr>
</table>

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3.11 Overview of Hazardous Waste Generator Requirements, Continued

Generator Requirement Overview (continued)

Stage	Description
6	Plan for emergencies: • Have an Emergency Coordinator on the premises or on call. • Post all emergency communication information, such as name and telephone number of Emergency Coordinator; locations of fire extinguishers, spill control material, and fire alarm; and telephone number of fire department. • Report all spills into the environment to the Department of Ecology's Southwest Regional Office. • Ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures relevant to their day-to-day responsibilities.
7	Use proper containers and manage them correctly: • Reactive and ignitable wastes are stored in a manner equivalent with the International Fire Code (section 2704). • Wastes are accumulated in compatible, sturdy, leak-proof, closed containers. • All containers are visible for inspection. • Do not accumulate incompatible wastes in the same container or in the same area.
8	Arrange for proper transportation and disposal through the Administrative Officer: • Package, label, and mark all containers in accordance with the federal DOT regulations prior to shipment. • Carefully select a permitted hazardous waste treatment, storage, and disposal or recycling facility, or a legitimate recycler, to handle the waste.
9	Manifest shipment of hazardous waste: • Use Uniform Hazardous Waste Manifest Form 8700-22 to ship waste • Fill in the manifest completely and clearly • Check all manifest information for accuracy, even if the transporter has completed the manifest. • Verify that a land disposal restriction certificate is attached to the manifest if the waste is restricted from land disposal. • If a signed manifest is not received from the receiving facility within 35 days of pick-up, contact the facility to determine what the disposition of the waste is. If a signed manifest is not received from the receiving facility within 45 days, file an **exception report** with Ecology.

Continued on next page

3.11 Overview of Hazardous Waste Generator Requirements, Continued

Generator Requirement Overview (continued)

Stage	Description
10	Keep records of hazardous waste activity: • Keep results from laboratory tests on the wastes. • Keep copies of annual reports, all shipping manifests, land disposal restriction certifications, notification forms, and exception reports for a minimum of 5 years. • Keep an inspection log on site (See Appendix 11).

3.12 Hazardous Waste Identification

Definition

A complete definition of a hazardous waste can be found in 40 CFR Part 261, Subpart C and WAC 173-303. Accurate waste identification is essential to ensure the material is handled safely and managed properly.

Application and Responsibility

All Materials Lab personnel who handle or generate hazardous waste are responsible for correctly identifying the waste. The Chemical Hygiene Officer is responsible for ensuring that a hazardous waste is correctly identified.

Categories of Hazardous Waste

Hazardous waste can fall into one of the following categories:

- Discarded chemical product or dangerous waste sources list (see Chapter 173-303-9903 and -9904 of the Dangerous Waste Regulations)
- Ignitable (flash point of 140 °F or less)
- Corrosive waste (pH less than 2 or greater than 12.5)
- Reactive (could explode, generate harmful vapors, or is an oxidizer; for example, cyanides).
- Toxic
- Toxic or persistent (see WAC 173-303-100; for example, trichloroethylene (TCE), coal tar).

Hazardous wastes generated by the individual lab units (not including samples that will be shipped back to the suppliers or recycled) are listed in the following table:

Lab Unit	Hazardous Waste	Category and Waste Code
Chemical Lab	Outdated chemicals	Discarded chemical products – Miscellaneous
Chemical Lab	Acid Waste Solutions Containing High Metals	Corrosives – D002, WL02
Chemical Lab	Solvent Waste (for example, toluene, acetone)	Ignitable – D001
Chemical Lab	Urethane Paints (test samples to be disposed).	Ignitable – D001

Continued on next page

Hazardous Waste Identification, Continued

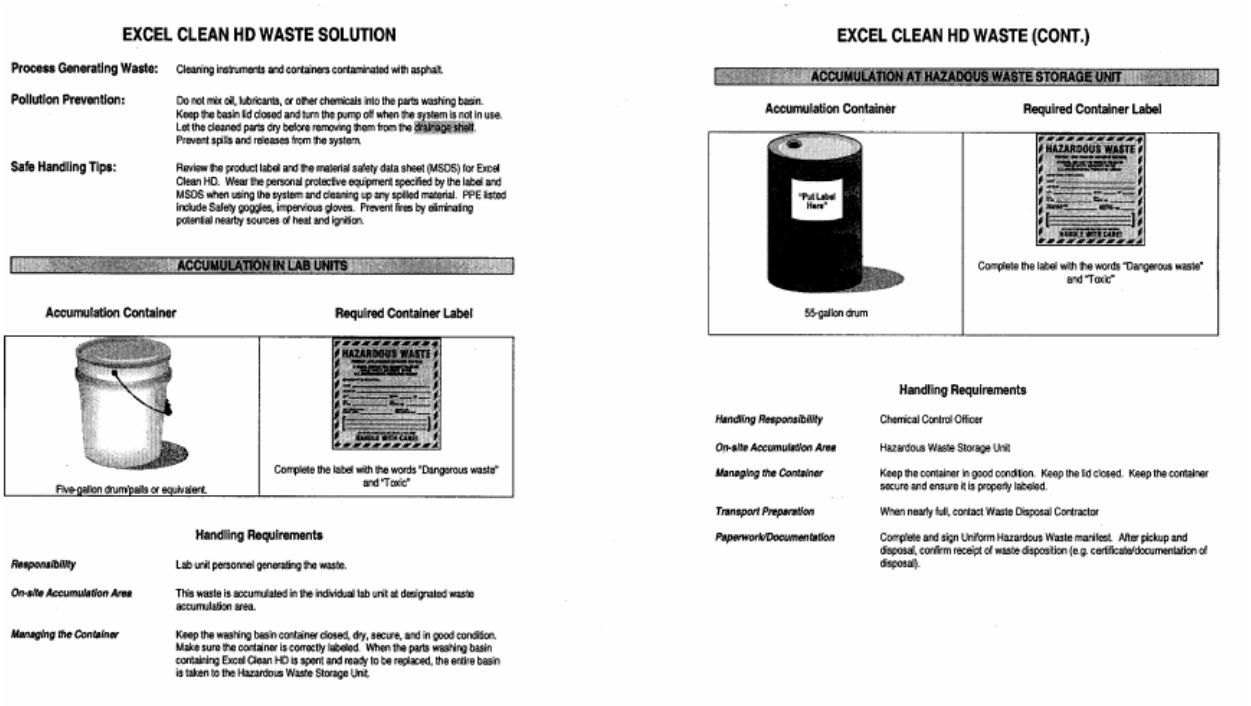
Categories of Hazardous Waste (continued)

Lab Unit	Hazardous Waste	Category and Waste Code
Liquid Asphalt Lab	Excel Clean HD Waste Solutions	Toxic – WT02
Liquid Asphalt Lab	Trichloroethylene	Toxic – D040
Liquid Asphalt Lab	Broken or off-spec thermometers containing mercury	Toxic – D009, WL02
Liquid Asphalt Lab	Acetone-soaked rags	Ignitable – D001
Bituminous Mixtures Lab	Excel Clean HD waste solutions	Toxic – WT02
Physical Testing Lab	Acid waste solutions	Corrosives – D002
Physical Testing Lab	Sodium hydroxide waste solutions	Corrosives – D002
Physical Testing Lab	Potassium hydroxide waste solutions	Corrosives – D002
Physical Testing Lab	Calcium hydroxide waste solutions	Corrosives – D002
Geotechnical Lab	Acid waste solutions	Corrosives – D002

3.13 Hazardous Waste Handling

Handling Individual Wastes

A Waste Handling Sheet (WHS) that illustrates the waste handling requirements has been developed for each of the waste streams generated on a routine basis at the Materials Lab. The WHS provides easy-to-understand instructions for waste management activities. If you handle the waste in the manner specified in the WHS, your actions are in compliance with the applicable federal and state laws and regulations. Prior to handling any wastes, review the specific WHS. All sections of the WHS are described in the example below. The WHSs for selected waste streams are located in the Appendix 6.



EXCEL CLEAN HD WASTE SOLUTION

Process Generating Waste: Cleaning instruments and containers contaminated with asphalt.

Pollution Prevention: Do not mix oil, lubricants, or other chemicals into the parts washing basin. Keep the basin lid closed and turn the pump off when the system is not in use. Let the cleaned parts dry before removing them from the drainage shelf. Prevent spills and releases from the system.

Safe Handling Tips: Review the product label and the material safety data sheet (MSDS) for Excel Clean HD. Wear the personal protective equipment specified by the label and MSDS when using the system and cleaning up any spilled material. PPE listed include Safety goggles, impervious gloves. Prevent fires by eliminating potential nearby sources of heat and ignition.

ACCUMULATION IN LAB UNITS

Accumulation Container	Required Container Label
Five-gallon drum/pails or equivalent.	Complete the label with the words "Dangerous waste" and "Toxic"

Handling Requirements

Responsibility	Lab unit personnel generating the waste.
On-site Accumulation Area	This waste is accumulated in the individual lab unit at designated waste accumulation area.
Managing the Container	Keep the washing basin container closed, dry, secure, and in good condition. Make sure the container is correctly labeled. When the parts washing basin containing Excel Clean HD is spent and ready to be replaced, the entire basin is taken to the Hazardous Waste Storage Unit.

EXCEL CLEAN HD WASTE (CONT.)

ACCUMULATION AT HAZADOUS WASTE STORAGE UNIT

Accumulation Container	Required Container Label
55-gallon drum	Complete the label with the words "Dangerous waste" and "Toxic"

Handling Requirements

Handling Responsibility	Chemical Control Officer
On-site Accumulation Area	Hazardous Waste Storage Unit
Managing the Container	Keep the container in good condition. Keep the lid closed. Keep the container secure and ensure it is properly labeled.
Transport Preparation	When nearly full, contact Waste Disposal Contractor
Paperwork/Documentation	Complete and sign Uniform Hazardous Waste manifest. After pickup and disposal, confirm receipt of waste disposition (e.g. certificate/documentation of disposal).

Sections of the Waste Handling Sheet

The sections of a waste handling sheet are described below:

1 ***This section includes important information about the waste such as:***

- How the waste is generated
- **Strategies for pollution prevention** (tips about re-use, recycling, and/or reducing the volume or toxicity of the waste)
- Tips for safe handling

Continued on next page

3.13 Hazardous Waste Handling, Continued

This section includes information regarding managing the wastes in the Satellite Waste Accumulation Areas:

- The **right container** to accumulate the waste
- The **required label** for the container
- **Responsibility** for managing the waste
- The location where the waste is accumulated at the Materials Lab
- Tips for managing the waste and/or container

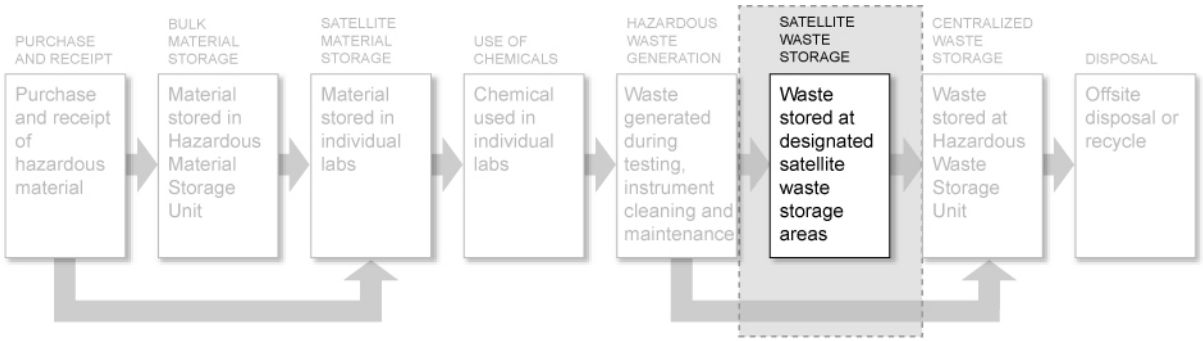
This section includes information about managing the waste at the Hazardous Waste Storage Unit:

- The **right container** to accumulate the waste
- The **required label** for the container
- **Responsibility** for managing the waste
- The location where the waste is accumulated at the Materials Lab
- Tips for managing the waste and/or container
- Tips for preparing the waste for transport by the vendor
- Required documentation

3.14 Waste Storage at Laboratory Satellite Waste Storage Areas

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Application

This procedure applies to all staff who handle hazardous waste generated at the Materials Lab.

Definition of Satellite Accumulation Area

A satellite accumulation area is an area at or near any point of generation where dangerous waste is initially accumulated in containers before consolidating the waste at a designated accumulation area or storage area (that is, Hazardous Waste Storage Area B160).

Satellite Waste Storage Areas

Each laboratory should have designated satellite storage areas for all waste streams routinely generated. Avoid storing wastes on the floor.

Secondary Containment

Secondary containment is required in circumstances where there is a possibility that the chemical may spill and contaminate the area. This containment can be achieved in a variety of ways, such as:

- Use of chemical-resistant trays or other containers placed under the chemical container.
- Use of storage cabinets that are designed to contain spilled chemicals.

Continued on next page

3.14 Waste Storage at Laboratory Satellite Waste Storage Areas, Continued

Labeling

All hazardous waste containers must be labeled with the words "Hazardous Waste" or "Dangerous Waste" at the time the waste is first placed into the container. Affix a Hazardous Waste Label to filled containers (See Waste Handling Sheets in Appendix 6). The label must accurately identify the contents of the container.

Container Closure

Hazardous waste containers must be closed at all times during storage except when waste is being added or removed. Evaporation of wastes in fume hoods is prohibited.

Satellite Accumulation Provisions

The following is a list of provisions for maintaining satellite accumulation areas:

- There are no limits on accumulation time. Closed, properly labeled containers that are partially filled may remain in a Satellite Accumulation Area indefinitely.
- The area must be under the control of the operator of that process.
- Up to 55 gallons of hazardous waste or 1 quart of a particular acutely hazardous waste can be stored in a satellite accumulation area.
- Once the container becomes filled, the containers must be marked immediately with the accumulation start date.
- Containers must be removed from the satellite accumulation area within 3 days after the waste container becomes filled.

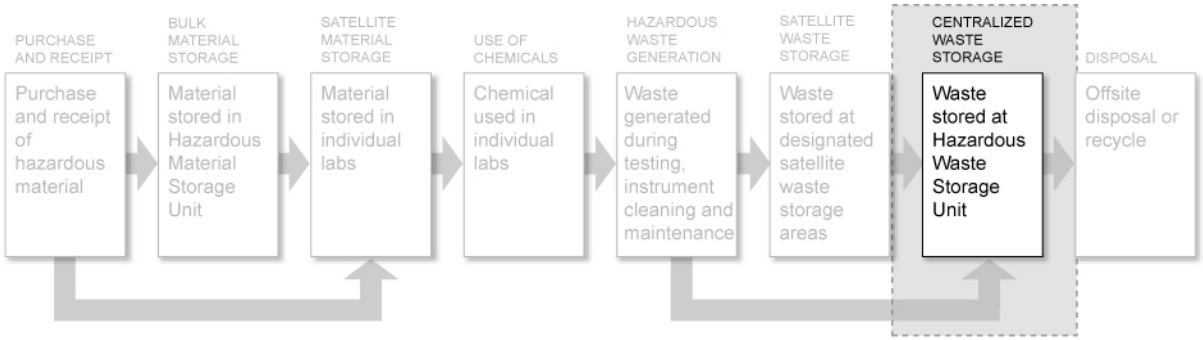
Training

Laboratory personnel should be trained in proper labeling and waste storage procedures. Laboratory personnel should also be familiar with Ecology regulations regarding satellite accumulation areas.

3.15 Waste Storage at Hazardous Waste Storage Unit (B160)

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Application

This procedure applies to all staff who handle hazardous waste generated at the Materials Lab.

Centralized Waste Storage at Hazardous Material Storage Unit

The Hazardous Waste Storage Unit (B160) is one of the two hazardous materials/hazardous waste storage units located at the west end of the loading dock outside of the main building. The other unit (B161) is used for storage of hazardous chemicals.

Construction of Storage Unit

The 12’ x 15’ storage unit is constructed on a raised foundation. It is equipped with explosion panel, 1-1/2 hour Curtain Fire Dampers with backdraft damper, mechanical vent, explosion-proof fixtures, and dry chemical fire extinguishing systems.

Continued on next page

3.15 Waste Storage at Hazardous Waste Storage Unit (B160), Continued

Security and Access Control

The Hazardous Waste Storage Unit has limited access. Ask a lab supervisor when storage unit needs to be accessed.

Spill Containment Features

The floor of the storage unit is equipped with 10-gauge steel grated decking throughout the width of the room. Accidental spills would be contained within the storage unit, which is designed to safely contain spills of up to 25 percent of the total storage capacity.

Hazardous Wastes Stored

Bulk chemicals are stored within this unit. Wastes that are typically stored in this unit are as follows:

Chemicals	Typical Quantity	Type of Container
Waste Trichloroethylene	20	1-Gallon Glass container
Waste Excel Clean HD	2	30- or 55-Gallon Poly Drums
Waste alcohol reagent	4	4-L Glass container
Waste Acid Solutions	24	4-L Glass container
Waste Paint	30	Quart container
Waste Curing Compound	30	Quart container
Waste Mercury	Broken thermometers	Plastic bags

Waste Storage Procedures

The following procedures should be adhered to when hazardous wastes are placed in the Hazardous Waste Storage Unit:

Step	Action
1	Within 3 days after a waste container in the satellite accumulation area is full, remove the waste from the satellite accumulation area and place it in the Hazardous Waste Storage Unit (B160).

Continued on next page

3.15 Waste Storage at Hazardous Waste Storage Unit (B160), Continued

Waste Storage Procedures (continued)

Step	Action
1	Depending on the type of waste being stored, ensure you have the proper PPE and transporting device, such as nitrile gloves, respirator, jug carrier, carts, etc.
2	Transport the waste to the Hazardous Waste Storage Unit (B160).
3	If necessary, transfer waste from the smaller container into the larger waste container with care. The acids should be placed in the Acid Storage Cabinet located inside the Hazardous Waste Storage Unit.
4	Close the containers tightly. Place the bulk container back in its appropriate location.
5	Note the date, type of waste, and quantity you have placed in the Hazardous Waste Storage Unit on the Waste Storage Log located near the entrance.
6	Secure Hazardous Waste Storage Unit.

Training

All Materials Lab workers should be trained in proper procedures for waste storage at the Hazardous Waste Storage Unit.

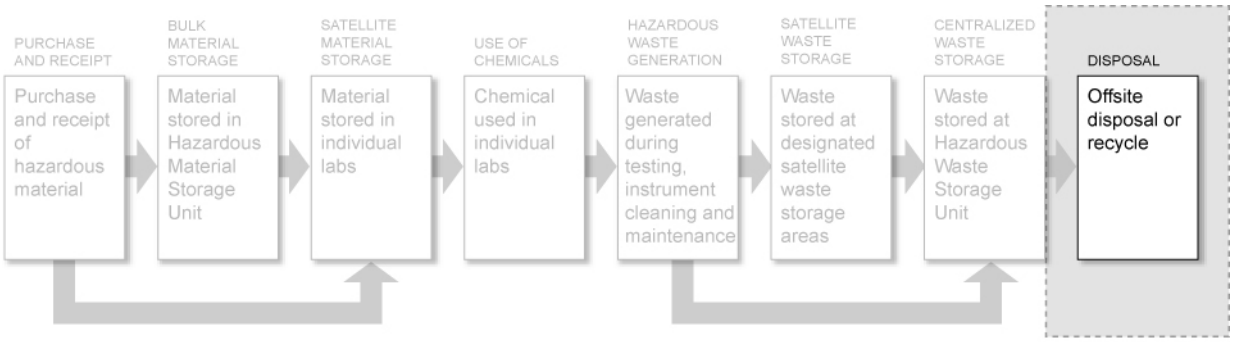
Record

Waste Storage Log (See Appendix 11)

3.16 Hazardous Waste Disposal

Hazardous Material Handling Activity

The activities involving the handling of hazardous material discussed in this section are shown below:



Activities Involving Handling of Hazardous Material

Application

This procedure applies to the Chemical Hygiene Officer and Section Supervisors, who are responsible for proper disposal of hazardous waste generated at the Materials Lab.

Disposal Procedure from Hazardous Waste Storage Unit

Currently, the Materials Lab is a medium quantity generator (generating between 220 to 2,200 pounds of waste each month). As such, the lab has 180 days from the date the waste was first placed in a container in the Hazardous Waste Storage Unit to dispose of the waste.
The procedure for transporting the wastes offsite are as follows:

Step	Action
1	Notify individual lab units so they have the opportunity to bring their hazardous wastes accumulated in the satellite waste storage areas to the Hazardous Waste Storage Unit for disposal.
2	Contact the administrative officer who will coordinate waste disposal with a contracted hazardous waste disposal vendor.
3	Ensure that wastes are properly packaged, labeled, marked and placarded for shipment.
4	Ensure that the Uniform Hazardous Waste Manifests, which accompany the shipment of hazardous waste from the lab to its ultimate destination, are completed properly by the disposal vendor.

Continued on next page

3.16 Hazardous Waste Disposal, Continued

Disposal Procedure from Hazardous Waste Storage Unit (continued)

Step	Action
5	Sign and date the manifest form. Retain one of the signed copies.
6	If the waste is restricted from land disposal, ensure that a land disposal restriction certificate (see below) is completed and attached to the manifest.
7	Contact the transporters and/or facility if the last signed copy of the manifest forms have not been received within 35 days of the shipment date. Submit an exception report to Ecology if the last copy of the manifest has not been received within 45 days of the shipment date.

Land Disposal Restriction Notices

EPA regulations require that nearly all hazardous waste be treated prior to land disposal (40 CFR 268). Hazardous waste generators are required to notify the receiving treatment, storage, and disposal facility (TSDF) when they ship land disposal restricted (LDR) wastes. LDR notices accompany the hazardous waste manifest and include the generator's identification number, the appropriate treatment standards, and the accompanying manifest number.

Lab Packing

Because lab wastes typically include a diverse array of chemicals in small quantities, chemicals can either be consolidated into bulk waste streams that meet specific characteristics, or they can be "lab-packed." When lab-packed, small containers of compatible waste materials are placed intact into a larger packaging unit; usually a steel or fiber drum. The larger container contains an absorbent material, such as vermiculite, to cushion the containers and absorb spilled or leaked waste. An inventory is made as the containers are added to the drum. The drum is then sealed and a copy of the inventory sheet is attached to the drum. The drum is then shipped off site for disposal, accompanied by a uniform hazardous waste manifest.

Training

All laboratory workers who handle hazardous wastes should be trained in proper waste disposal procedures.
All workers who package hazardous wastes for shipment need to be trained as HazMat employees, as discussed in 49 CFR 172 Subpart H.

Records

- Uniform Hazardous Waste Manifest
- Land Disposal Restriction Notices

3.17 Sample Shipping and Disposal

Background

The Materials Lab receives samples and materials from a variety of sources, including manufacturers, vendors, and other WSDOT units. Many of the samples would be classified as hazardous waste if disposed; therefore, proper handling of these samples and materials is crucial.

Application

Sample and material shipping is applicable to the following lab units:

- Chemical Lab
- Liquid Asphalt Lab
- Bituminous Mixtures Lab
- Physical Testing Lab
- Geotechnical Lab

Policy

Samples that have been tested or samples that are no longer needed are shipped back to the supplier, disposed as municipal solid waste, or disposed in the recycling dumpsters, depending on the type of material. Hazardous material must not be disposed as municipal solid waste or in the recycling dumpster.

Method of Disposal

The methods of disposal for various types of samples are listed in the following table:

Lab	Sample or Material	Method of Disposal
Chemical Lab	Joint Materials	Mix the two-part components, then dispose as solid waste.
Chemical Lab	Fencing	Recycle
Chemical Lab	Raised Pavement Markers	Dispose as solid waste
Chemical Lab	Epoxies and Polyesters	Mix Parts A and B, cure, and then dispose as solid waste. Keep a log of material mixed.
Chemical Lab	Conduits	Recycle
Chemical Lab	Bearing pad material	Dispose as solid waste
Chemical Lab	Deicers	Use in lab applications or dispose in sewer (liquids) or as solid waste (solids).
Chemical Lab	Urethane paints	Hazardous Waste
Liquid Asphalt	Lane Marker Adhesives	Use in applications or dispose as solid waste

Continued on next page

3.17 Sample Shipping and Disposal, Continued

Method of Disposal (continued)

Lab	Sample or Material	Method of Disposal
Liquid Asphalt Lab	Emulsified asphalts	Ship back to supplier
Liquid Asphalt Lab	Binders	Dispose as solid waste
Bituminous Lab	Asphalt Rock	Dispose in Recycle Dumpster
Physical Testing Lab	Aggregate	Dispose in Recycle Dumpster
Physical Testing Lab	Cement Cylinders	Dispose in Recycle Dumpster
Physical Testing Lab	Concrete	Dispose in Recycle Dumpster
Physical Testing Lab	Curing Compound	Dispose as hazardous waste
Physical Testing Lab	Steel	Recycle by DOT Olympic Regional Office
Physical Testing Lab	Geotextiles	Dispose as solid waste as solid waste
Geotechnical Lab	Soil	Dispose as solid waste

Shipping Procedure

The procedure for shipping the samples (for example, emulsified asphalts) back to suppliers is as follows:

Step	Action
1	Package samples in appropriate containers.
2	Make sure that the sample transmittal form associated with the sample accompanies the container.
3	Complete and affix appropriate shipping paper. If shipping hazardous material, make sure U.S. DOT hazardous material shipping requirements are met.
4	Transport the containers to Shipping area for pickup.

Training

All laboratory workers who handle samples should be trained in proper sample disposal and U.S. DOT hazardous material shipment procedures.

Records

- Sample transmittals
- U.S. DOT hazardous material shipping documents

Chapter 4 Facility-Based Environmental Health and Safety (EH&S) Procedures

4.1 Overview

Introduction

This section of the manual addresses environmental requirements that are "facility-related" rather than based on specific business processes and operations. These requirements include facility and equipment management operations, emergency spill response, general laboratory safety, PPE, MSDSs, and other facility-based health and safety procedures.

Contents

This section contains the following topics:

Topic	See Page
4.2 Facility and Equipment Maintenance Operations	4-2
4.3 Emergency Response Procedures and Equipment	4-4
4.4 General Laboratory Safety	4-12
4.5 Use of Fume Hood	4-16
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4.11 Fire Safety	4-33
4.12 Medical Emergency Including Injury or Illnesses	4-36
4.13 NFPA Hazard Codes	4-39
4.14 Procedures for Carcinogens, Reproductive Toxins, Substances with High Acute or Unknown Toxicity	4-42

4.2 Facility and Equipment Maintenance Operations

Background

The Facility and Equipment Management Operations section is responsible for the handling of certain hazardous materials, as well as non-hazardous materials that can be recycled, that are generated as a result of maintaining the facility and equipment.

Application

This section is applicable to Facility and Equipment Management Operations personnel.

Policy

The Materials Lab will work to minimize the generation of waste, and will recycle or treat wastes that cannot be eliminated. All wastes that are generated will be handled, accumulated, transferred and disposed in accordance with all applicable federal and state laws and regulations.

Types of Wastes and Recyclable Materials Generated

The following are examples of wastes and recyclable materials that are handled at the Materials Lab. These are typically handled by Facility and Equipment Management Operations personnel. The wastes listed below are grouped in categories according to the regulations that govern their handling and disposal.

Waste Category	Material	Method of Disposal
Hazardous Waste	Full and partially filled chemical product containers (such as aerosol paint, oil-based paints, aerosol cleaners, degreasers, lubricants, etc.)	Review MSDS. Dispose of as hazardous waste (see Waste Handling Sheet in Appendix 6).
Universal Waste	Fluorescent lights (tubes and mercury lamps)	Accumulate in approved container. When full, contact Eco-Light for pick-up.
Universal Waste	Spent batteries (alkaline, NiCad, and lithium)	Accumulate in designated containers. When full, take it to the WSDOT Olympic Regional Office.

Continued on next page

4.2 Facility and Equipment Maintenance Operations, Continued

Types of Wastes and Recyclable Materials Generated (continued)

Waste Category	Material	Method of Disposal
Recyclable Material	Waste oil	Recycle at WSDOT Olympic Regional Office
Recyclable Material	Used shop rags	Accumulate in labeled container. WSDOT Laundry Services contractor will it pick up.
Recyclable Material	Paper, cardboard	Recycle in container provided by the contractor
Solid Waste	Used paint material	Dispose as solid waste

Training

Facility and Equipment Management Operations personnel should be trained on the appropriate handling of the waste streams listed in this section.

4.3 Emergency Response Procedures and Equipment

Application

This section applies to all Materials Lab personnel.

Policy

The WSDOT Materials Engineer and the individual Section Supervisors have the primary responsibility for ensuring that hazardous materials are used safely and for informing their staff of the proper procedures to follow in the event of a hazardous material spill or other emergency.
All accidents, regardless of severity, should be reported and investigated.

Emergency Action Plan

The Emergency Action Plan along with the Evacuation Plan is located in Appendix 7.

Spill Reporting

All product spills must be reported to laboratory management, and the employee and supervisor must complete the Chemical Spill Report Form (Appendix 7). All associated injuries and/or potential exposures related to an emergency spill (see below) must be reported to the Safety and Health Services Office. Minor spills should be cleaned up immediately using the appropriate PPE, spill-kits and neutralizing agents. In addition, all minor spills shall be reported to the lab supervisor with the following information:

- Date
- Time
- Location
- Chemical(s) and their volume,
- Names of all persons involved, including any visitors who were exposed and personnel involved in the cleanup

Continued on next page

4.3 Emergency Response Procedures and Equipment,
Continued

Spill Kit Contents and Locations

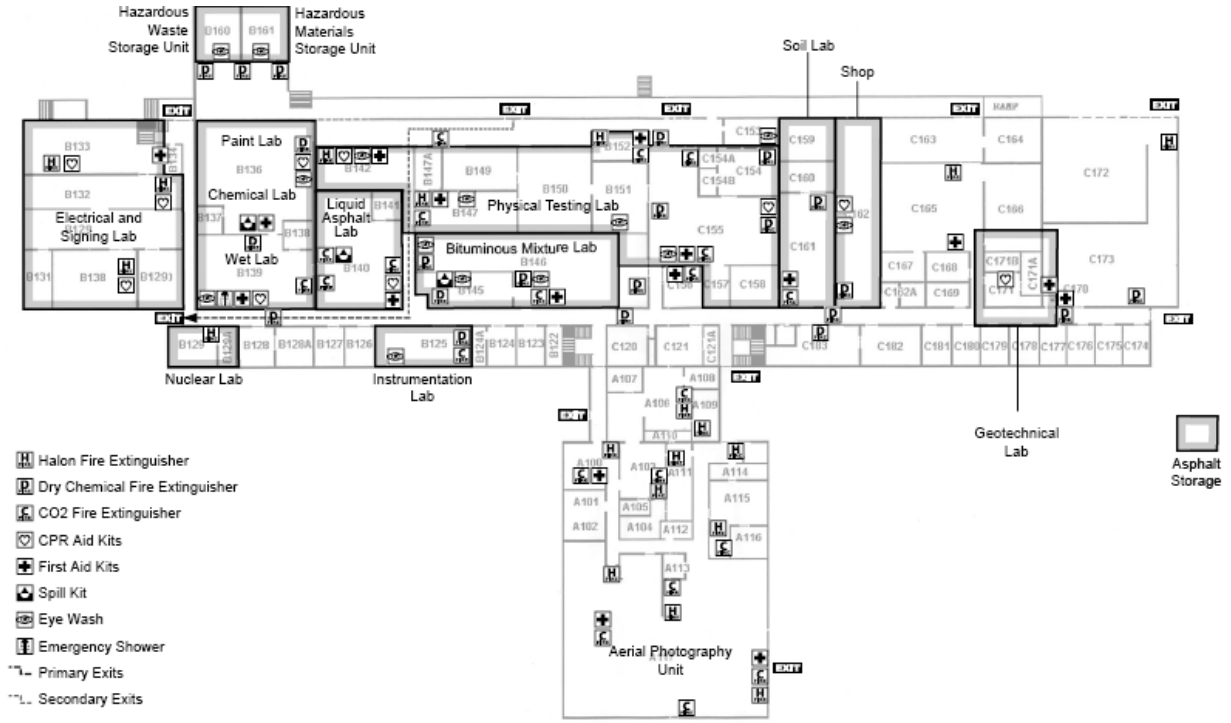
Special spill kits are available from a variety of sources. If a spill kit is purchased, follow the manufacturer's directions. A spill kit contains the following items at a minimum:

- An inert absorbent such as kitty litter or vermiculite
- A plastic(non-sparking) scoop
- Plastic bags to put the spilled material into
- Heavy gloves
- Goggles
- Sodium bicarbonate to neutralize acids

A spill kit should be immediately accessible at each location where hazardous material is used or stored (see figure below). All laboratory employees must know where spill kits are located and know how to use them. At a minimum, each lab should have a spill kit for chemicals used.

Emergency Wash Station Locations

The location of emergency wash stations are shown in the figure below. Emergency showers and eyewash stations must be check for functionality at least monthly and a record of the inspections shall be kept in the laboratory.



Emergency Response Equipment

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4.3 Emergency Response Procedures and Equipment,
Continued

Spill Response Procedures

Three types of spills are discussed in the following sections:
- Emergency Spill
- Minor spills
- Mercury spills

Emergency Spill

A chemical spill is classified as an **Emergency Spill** whenever it:
- Causes personal injury or chemical exposure that requires medical attention
- Causes a fire hazard or uncontrollable volatility
- Requires a need for breathing apparatus of the supplied air or self-contained type to handle the material involved
- Involves or contaminates a public area
- Causes airborne contamination that requires local or building evacuation
- Causes a spill that cannot be controlled or isolated by laboratory personnel
- Causes damage to property that will require repairs
- Cannot be properly handled because of a lack of local trained personnel and/or equipment to perform a safe, effective cleanup
- Requires prolonged or overnight cleanup
- Involves an unknown substance
- Enters the land or water

Although the following tactics are prioritized in terms of usual preferred action sequences, each spill incident is unique and involves persons with varying levels of spill expertise and experience. Thus, for any individual incident, isolation of the spill and/or securing the area might best occur prior to or simultaneously with contacting the fire department at 911.

Step	Action
1	Contact the fire department at 911. Notify dispatcher of location of the spill and, if known, the chemical spilled.
2	If the spill presents an immediate danger, leave the spill site and warn others, control entry to the spill site, and wait for HazMat response.
3	Remove contaminated clothing. Flush skin/eyes with water at least 15 minutes to 30; use soap for intermediate and final cleaning of skin areas.
4	Protect yourself, then remove injured person(s) to fresh air if safe to do so.
5	Notify nearby persons and evacuate as necessary. Prevent entry, as necessary, by posting a guard in a safe area and/or shutting doors.

Continued on next page

4.3 Emergency Response Procedures and Equipment,
Continued

Emergency Spill (continued)

Step	Action
6	If flammable vapors are involved, do not operate electrical switches unless to turn off motorized equipment. Try to turn off or remove heat sources where safe to do so.
7	If the substance involved is an unknown, then emergency spill response procedures are limited to self-protection, notification of fire department at 911 for response, isolation of the chemical, and evacuating and securing the area involved. Do not touch the spill without protective clothing.
8	Where the spill does not present immediate personal danger, try to control the spread or volume of the spill. This could mean shutting a door, moving nearby equipment to prevent further contamination, repositioning an overturned container or one that has a hole in the bottom or side, creating a dike by putting an absorbent around a spill, or opening the sashes on the fume hoods to facilitate removal of vapors.
9	Never assume gases or vapors do not exist or are harmless because of lack of smell.
10	Increase ventilation by opening closed fume hood sashes to the 12-inch or full open position. Exterior doors may be opened to ventilate non-toxic vapors.
11	Use absorbents to collect substances. Reduce vapor concentrations by covering the surface of a liquid spill with absorbent. Control enlargement of the spill area by diking with absorbent.

Minor Spills

Minor spills are those spills that do not fit the requirements for emergency spills.

Step	Action
1	Attend to any persons who may have been contaminated. If these persons require medical attention this is an Emergency Spill.
2	Notify persons in the immediate area about the spill.
3	Evacuate all nonessential personnel from the spill area.
4	If the spilled material is flammable, turn off ignition and heat sources.
5	Avoid breathing vapors of the spilled material. If respiratory protection is necessary, this is an Emergency Spill (see above).
6	Leave on or establish exhaust ventilation if it is safe to do so.

Continued on next page

4.3 Emergency Response Procedures and Equipment,
Continued

Minor Spills (continued)

Step	Action
7	Secure supplies to conduct the cleanup.
8	Don appropriate PPE. Never assume gases or vapors do not exist or are harmless because of lack of smell.
9	**Spilled Liquids**

Step	Action
1	Confine or contain the spill to a small area. Do not let it spread.
2	For small quantities of inorganic acids or bases, use a neutralizing agent or an absorbent mixture (soda ash or diatomaceous earth). For small quantities of other materials, absorb the spill with a nonreactive material (such as vermiculite, clay, dry sand, or towels).
3	For larger amounts of inorganic acids and bases, flush with large amounts of water (providing the water will not cause additional damage). Flooding is not recommended in storerooms where violent spattering may cause additional hazards, or in areas where water-reactive chemicals may be present.
4	For solvent spills, extinguish all ignition sources in the area. Solvent spills need to be properly ventilated because of their flammability and ignitability. Do not clean up spills of toxic volatile solvents (see Dangerous Material Spills above). Solvent spills are cleaned up by applying the absorbent material in the spill kit to the area from the perimeter inward. Make sure enough of the material is added to cover all of the spill. Mix the absorbent material with the spill until the absorbent material regains its appearance as a dry powder is flammable, turn off ignition and heat sources.
5	Mop up the spill, wringing out the mop in a sink or a pail equipped with rollers.
6	Carefully pick up and clean any cartons or bottles that have been splashed or immersed.
7	If needed, vacuum the area with a HEPA-filtered vacuum cleaner designed for the material involved.
8	If the spilled material is extremely volatile, let it evaporate and be exhausted by the laboratory hood (if authorized for use with the spilled chemical).

Continued on next page

4.3 Emergency Response Procedures and Equipment,
Continued

Minor Spills (continued)

Step	Action
9 (cont.)	**Spilled Solids** Generally, sweep spilled solids of low toxicity into a dust pan and place them into a container suitable for that chemical. Additional precautions, such as the use of a vacuum cleaner equipped with a HEPA filter, may be necessary when cleaning up spills of more highly toxic solids.
10	Dispose of residues according to safe disposal procedures, remembering that PPE, brooms, dust pans, and other items may require special disposal procedures.
11	Report the chemical spill in writing as required above.

Mercury Handling and Spill Cleanup

Because of the health effects of mercury and the extremely difficult and time-consuming procedures required to properly clean mercury spills, every effort should be taken to prevent accidents involving mercury.
The following general procedures should be used for all minor spills:

Step	Action
1	Don protective clothing. For small spills, a laboratory coat, safety glasses, and gloves should be used. Gloves made of the following have been rated as excellent for protection against elemental mercury: • Chlorinated polyethylene (CPE) • PVC • Polyurethane, nitrile rubber (also called Viton and several other brand names) • Butyl rubber neoprene If mercury has been spilled on the floor, the workers involved in cleanup and decontamination should wear plastic shoe covers. The fire department at 911 should be called immediately if a spill is extensive enough to require workers to kneel or sit where mercury has been spilled, because Tyvek® or similar impermeable clothing will be required.

Continued on next page

4.3 Emergency Response Procedures and Equipment,
Continued

Mercury Handling and Spill Cleanup (continued)

Step	Action
2	Obtain Mercury Spill Kits. Special spill kits are available from a variety of sources. If a spill kit is purchased, **follow the manufacturer's directions**. Alternatively, a kit can be assembled with the following components: • Protective gloves • Mercury suction pump or disposable pipettes to recover small droplets • Elemental zinc powder (or commercial amalgam material) • Dilute sulfuric acid (5-10 percent) in spray bottle • Sponge or tool to work amalgam • Plastic trash bag • Plastic container (for amalgam) • Plastic sealed vial for recovered mercury
3	Remove gross contamination by pushing together pools and droplets of metallic mercury and then collect the mercury using a suction pump.
4	After the gross contamination has been removed, sprinkle the entire area with zinc powder. Spray the zinc with the dilute sulfuric acid.
5	Using the sponge, work the zinc powder/sulfuric acid into a paste consistency while scrubbing the contaminated surface and cracks or crevices.
6	To minimize contamination of housekeeping items, stiff paper may be used to assist in cleaning up the amalgam.
7	After the paste has dried, it can be swept up and placed into the plastic container for disposal.
8	Rags, shoe covers, sponges and anything used for the cleanup should be placed in a trash bag and labeled to be disposed of as hazardous waste. Leave on or establish exhaust ventilation if it is safe to do so.

Continued on next page

4.3 Emergency Response Procedures and Equipment,
Continued

Leaking Compressed Gas Cylinders

Occasionally, a cylinder or one of its component parts develops a leak. Most such leaks occur at the top of the cylinder in areas such as the valve threads, safety device, valve stem and valve outlet.
If a leak is suspected, do not use a flame for detection; rather, a flammable-gas leak detector or soapy water or other suitable "snoop" solution should be used. If the leak cannot be remedied by tightening a valve gland or a packing nut, consult with the supplier for instructions.
If the substance in the compressed gas cylinder is not inert, or is hazardous, evacuate the area immediately and contact 911.
If the substance in the compressed gas cylinder is inert or non-hazardous, contact the supplier for instructions.

Training

All Materials Laboratory personnel who potentially may need to cleanup spills shall be adequately trained in hazard communications and the use, care, and maintenance of PPE.

Records

Chemical Spill Report
Incident Report Form

4.4 General Laboratory Safety

Applicability

This section applies to all Materials Lab personnel who come into contact with hazardous material.

General Safety

Everyone in the lab is responsible for his or her own safety and for the safety of others. Before starting any work in the lab, become familiar with the procedures, equipment, and chemicals that are to be used.

Personal Practices

The following personal practice guidelines are recommended for working safely in a lab:

- Shorts, sandals, or open-toed shoes should not be worn in the lab.
- Pets and unsupervised children are not allowed in laboratories.
- Never pipette anything by mouth.
- Be aware of dangling jewelry, loose clothing, or long hair that might get caught in equipment.
- No eating, drinking, smoking, gum chewing, or applying of cosmetics of any kind will be permitted in designated areas of the lab.
- Store food and drinks in refrigerators that are designated for that use only.
- Wash your hands after handling hazardous materials.
- Use caution when wearing contact lenses in a lab because chemicals or particulates can get caught behind them and cause severe damage to the eye.
- Safety glasses must be worn at all times in the designated laboratory areas.
- Glasses must have American National Standards Institute (ANSI) Z87 approval, and must have side shields.
- All visitors must wear safety glasses in the designated laboratory areas.
- All injuries and accidents must be reported immediately to the employee's respective supervisor.
- Know the location of, and how to use, the emergency equipment (that is, fire extinguishers, eye-wash stations, showers, etc.).
- Avoid distracting or startling others. Practical jokes or horseplay are not tolerated in the laboratory.

Continued on next page

4.4 General Laboratory Safety, Continued

House Keeping

The following house keeping guidelines are recommended for working safely in a lab:

- Clean your work areas throughout the day and before you leave at the end of the day.
- If necessary, clean equipment after use to avoid the possibility of contaminating the next person who needs to use it.
- Keep all aisles and walkways in the lab clear to provide a safe walking surface and an unobstructed exit.
- Spills must be cleaned up immediately using established cleanup procedures described in Chapter 4.3 Emergency Response Procedures and Equipment.

Labels

The following labeling protocols must be followed:

Step	Action
1	When a new chemical container is received from the supplier, check to see if the supplier's containers have the following information written on the manufacturer's label for identification purposes: • Description of contents • Concentration • Appropriate hazard labels **Note:** Chemicals in the original container, as supplied by the manufacturer, are usually correctly labeled. Do not deface or remove this label.
2	Add the following information to the supplier's container label: • Date of receipt in laboratory • Name of person who purchased the chemical • Date first opened
3	When a chemical is transferred to a secondary container, the container must be labeled with the following: • Date of preparation • Name of person who prepared the solution • Name of chemical or mixture and percent concentration(s) • Appropriate hazard labels
4	Be sure to read the label before beginning work with any chemical.

Continued on next page

4.4 General Laboratory Safety, Continued

Working Alone

- Never work alone in a lab if it is avoidable!
- Arrangements must be made with the Section Supervisor prior to any employee working alone in the lab. Materials tests known to be hazardous are not to be undertaken by a worker who is alone in the laboratory.
- The Section Supervisor has the responsibility for determining whether the work requires special safety precautions, such as having two persons in the same room or in the laboratory during a particular operation.

Unattended Operations

Plan for possible interruptions in utility services such as electricity, water, and gas when laboratory operations are carried out continuously or overnight. Operations must be designed to be safe and plans must be made to avoid hazards in case of failure.

Whenever possible, arrangements for routine inspection of the operation must be made and, in all cases, the laboratory lights must be left on in the area of the unattended instrument.

If there is a power outage, or if a water line break occurs while the operation is unattended, make sure the equipment safely stops the operation and does not pose a fire or health threat.

Glassware

Accidents involving glassware are a leading cause of laboratory injuries. Careful handling and storage of glassware is essential. The following guidelines should be followed while using glassware:

- Chipped or cracked glassware should be discarded or repaired immediately.
- Hand protection, such as a towel or cut-resistant gloves, must be used when inserting glass tubing into rubber stoppers or corks, or when placing rubber tubing on glass hose connections.
- Glass tubing will be fire-polished or rounded and lubricated.
- The use of plastic or metal connectors shall be considered and used wherever possible.
- Vacuum-jacketed glass apparatus must be handled with extreme care to prevent implosions.
- Equipment such as Dewar flasks will be taped or shielded.
- Only glassware designed for vacuum work will be used for that purpose.
- Heavy gloves are to be used as hand protection when picking up broken glass.
- Detailed instruction from the on-the-job training must be given on the proper use of glass equipment designed for specialized tasks that can represent unusual risks for the first-time user (for example, separatory funnels containing volatile solvents can develop considerable pressure during use).
- Designate a receptacle for broken glass.

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4.4 General Laboratory Safety, Continued

Training

- General laboratory safety principles and practice
- Labeling
- General chemical hazards and controls
- Procedures for the use of chemicals with unusual hazard potential, or extremely hazardous chemicals.

4.5 Use of Fume Hood

Applicable

This section applies to Materials Lab employees who use fume hoods.

Procedure for Checking the Fume hood Prior to Use

Prior to use, check to see that the fume hood is working properly by doing the following:

Step	Action
1	Close the sash to within 1 inch of being completely closed
2	Take a small strip of tissue and place it near the 1-inch opening
3	If the hood is working, the strip of tissue should be drawn into the hood, demonstrating negative pressure. If the strip does not show negative pressure, inform the Section Supervisor or Facilities Manager.

Proper Use of Fume hoods

The quality of protection afforded by the fume hood is affected by the manner in which the fume hood is used. The following precautions should be taken:

- Maintain sash and/or sash-panels in proper position.
- Never remove sliding sashes that are permanently installed on fume hoods.
- Make sure that the vertical sash is lowered to the marks indicated on the hood. This mark corresponds to a face velocity meeting the OSHA requirements. This also provides splash protection from the operation being performed.
- The face velocity of the hood is dependent on the sash being in the proper position. If the face area of the hood is increased by sliding the sash too high, the face velocity will be lowered, which reduces the capacity of the fume hood to capture and control airborne chemicals used inside of it. Decreasing the face area by pulling the sash down too low generally increases the face velocity. Increased velocities may create eddy currents around the body of the hood user and around articles inside the fume hood that may draw materials out of the hood and into the room, thereby compromising the protection the hood is designed to provide.
- Confirm that the flow is sufficient in the hood by checking the testing sticker and magnehelic gauge. The testing sticker should show that the hood has been tested within the last year and that the indicated flow rate average air velocity is above 100 feet per minute (fpm) (150 fpm for carcinogen use). The magnehelic gauge should show a pressure consistent with previously observed acceptable readings (for example, those readings that have a check mark in the column with the heading "OK").

Continued on next page

4.5 Use of Fume Hood, Continued

Proper Use of Fume hoods (continued)

- Do not put your head in the fume hood, particularly when there are contaminants in the hood.
- Perform work in a shallow tray if possible. If the hood does not have a recessed work area, minor spills will be contained in the tray or it will serve to minimize spillage out onto the lab floor.
- Locate the procedure, experiment, or apparatus as deeply as possible within the hood. This will act to maximize the efficiency of the hood.
- Keep the fume hood free of extraneous materials. Only those materials necessary to the procedure or experiment should be in the hood while work is being conducted.
- Do not block the slots between the airflow distribution baffles by storing containers in the hood. Blocking the baffles disrupts the airflow distribution and is an additional cause of poor fume hood performance.
- NEVER EVAPORATE PERCHLORIC ACID IN AN ORDINARY HOOD. Perchloric acid evaporation requires the use of a specifically designed hood with water-washdown capability (see Chemical Handling Sheet for Perchloric Acid, located in the Appendix 5). Failure to do this will result in the deposition of perchlorate crystals in the duct work, and these crystals may detonate.
- Never perform repairs or make mechanical connections to an existing fume hood, fume hood ducting, or other local exhaust ventilation system. The ventilation system may not have sufficient flow to handle the additional effluent and may disrupt other fume hoods and their users.
- Never remove distribution baffles (panels) installed in the exhaust systems and at the rear and top of the fume hood. The purpose of these baffles is to properly distribute air flow over the hood opening and work area.
- Never use a room or portable fan in a laboratory with a fume hood or local exhaust system. The air velocity developed by a room fan will disrupt the face velocity and overwhelm the ability of the fume hood to capture and control air contaminants generated inside it.
- If the door to the laboratory is difficult to open when the fume hood or local exhaust ventilation system is operating, a "make-up" air problem may exist. This develops when an inadequate supply of air is delivered to the room to compensate for the air exhausted by the operating fume hood. Notify the Laboratory Section Supervisor or the Facilities Manager if this happens.
- Do not paint or cover fume hood inspection stickers or sash opening indicators.

Continued on next page

4.5 Use of Fume Hood, Continued

Proper Use of Fume hoods (continued)

- Do not locate a work station opposite a fume hood. Materials splattered or forced out of a hood during an accident could injure a person seated across an aisle from a hood.
- Do not locate a work station where the only egress from the work station requires passage in front of the hood. A fire or chemical accident, both of which often start in a fume hood, can block an exit, rendering it impassable. For this reason, all labs are required to maintain two unobstructed means of egress.
- Do not locate flammable/combustible storage cabinets directly under a fume hood. Storage of flammable and combustible liquids under a fume hood creates a potential fire hazard because of the use of open flames and electrical devices in the fume hood.

Training

Employees should be trained in the proper operation of fume hoods.

4.6 Personal Protective Equipment

Background

This section contains information regarding the common types of PPE available, including protective clothing, eye protection, hand protection, respiratory protection, and hearing protection. Failure to properly select, maintain, and use the appropriate PPE required for specific work activities can result in bodily injuries to workers. These injuries vary greatly in severity (minor to severe) and type (for example, chemical or thermal burns, eye damage, broken bones, hearing loss, lacerations, amputation).

Policy

PPE alone should not be relied on to provide protection for Materials Lab workers. PPE should be used after all other reasonable means of reducing hazards have been carried out.

Application

All laboratory workers that handle hazardous material and wastes.

Responsibility

Section supervisors and laboratory personnel, in conjunction with the Chemical Hygiene Officer, are responsible for determining the proper PPE requirements for each activity. They also are responsible for ensuring that the appropriate PPE is available, and for communicating information about hazards and appropriate PPE selection to all workers in the area. It is the responsibility of the laboratory worker to use the appropriate PPE at all times.

PPE Hazard Assessment Procedure

Hazard assessments are part of the PPE program requirements at the Materials Lab. The PPE rule (WAC 296-800-16005) states that the employer (Section Supervisor) must assess physical and chemical hazards to which lab employees may be exposed. Then, based on the hazard assessment, a determination is made as to whether PPE is required and, if required, the exact kind of PPE needed to protect the employee. Finally, the employee is trained to properly use the PPE. A written record must be kept of the hazard assessment and the employee training for PPE use.

Continued on next page

4.6 Personal Protective Equipment, Continued

PPE Hazard Assessment Procedure (continued)

Step	Action
1	The Section Supervisors, in consultation with the Chemical Hygiene Officer, will determine the appropriate PPE for laboratory activities. In almost every instance, safety eyewear, durable clothing and footwear, lab shirts/coats, disposable latex/nitrile gloves, and hearing protection will be adequate for most lab activities.
2	Train the employee to properly use the PPE.
3	Whenever the employee's work activity changes, the PPE Hazard Training Certification Form must be reviewed to ensure proper PPE training has taken place.
4	Record the PPE training in the Training Records.

PPE Hazard Assessment Certification Form

The PPE Hazard Assessment Certification Form is located in the Appendix 8.

Protective Clothing

Protective equipment, such as eyewear, gloves, and respirators, is needed in designated areas. Instructions for selection and use of protective laboratory clothing are as follows:

- Wear protective aprons for special procedures such as transferring large volumes of corrosive material
- Remove protective clothing if there is visible or suspected hazardous contamination.

Eye Protection

Eye protection is required in all laboratory areas where corrosive or toxic materials are used or stored, and anywhere near high pressure or high vacuum equipment, or when carrying out work that can generate dust, spray, or other projectiles. Safety eyewear is required for lab visitors in these areas as well. Wear protection appropriate for the work being performed, as follows:

- In designated areas, glasses should be of unbreakable lenses (plastic or heat-tempered glass) with side shields.
- Work with significant risk of splash of chemicals, or projectiles: goggles.
- Work with significant risk of splash on face, or possible explosion: full-face shield, plus goggles.
- If safety glasses with correction lenses are needed, first consult with your optometrist or ophthalmologist.

Continued on next page

4.6 Personal Protective Equipment, Continued

Hand Protection

In the laboratory, gloves are used for protection from chemical products and physical hazards such as abrasion, tearing, puncture and exposure to temperature extremes. The basis for selecting glove material is as follows:

- Identification of the work procedures requiring hand protection
- Flexibility and touch sensitivity required; a need for high tactile sensitivity, for example, would restrict glove thickness, and some protocols may require the use of gloves with non-slip or textured surfaces
- Type and length of contact (for example, occasional or splash versus prolonged or immersion contact)
- Whether disposable or reusable gloves are more appropriate.

No single glove material is resistant to all chemicals, nor will most gloves remain resistant to a specific chemical for longer than a few hours. Determine which gloves will provide an acceptable degree of resistance by consulting the MSDS for the product, contacting the glove manufacturer, or by referring to a compatibility chart or table for permeation data. These resources may use the following terms:

- "Permeation rate" refers to how quickly the chemical seeps through the intact material: the higher the permeation rate, the faster the chemical will permeate the material
- "Breakthrough time" refers to how long it takes the chemical to seep through to the other side of the material
- "Degradation" is a measure of the physical deterioration (for example, glove material may actually dissolve or become harder, softer, or weaker) following contact with the chemical.

Guidelines for Glove Use

Guidelines for glove use include the following:

- Choose a glove that provides adequate protection from the specific hazard(s)
- Be aware that some glove materials may cause adverse skin reactions in some individuals, and investigate alternatives
- Inspect gloves for leakage before using; test rubber and synthetic gloves by inflating them
- Make sure that the gloves fit properly
- Ensure that the gloves are long enough to cover the skin between the top of the glove and the sleeve of the lab coat
- Discard worn or torn gloves as appropriate
- Discard disposable gloves that are, or may have become, contaminated
- Avoid contaminating "clean" equipment: remove gloves and wash hands before carrying out tasks such as using the telephone

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4.6 Personal Protective Equipment, Continued

Guidelines for Glove Use (continued)

- Always wash your hands after removing gloves, even if they appear not to be contaminated
- Follow the manufacturer's instructions for cleaning and maintenance of reusable gloves
- Before using gloves, learn how to remove them without touching the contaminated outer surface with your hands

Do not wear gloves outside lab areas.

Respiratory Protection

Respirators should be used only in emergency situations (for example, hazardous spills or leaks) or when other measures, such as ventilation, cannot adequately control exposures.

There are two classes of respirators: air-purifying, and supplied-air. The latter supply clean air from a compressed air tank or through an air line outside the work area, and are used in oxygen-deficient atmospheres or when gases or vapors with poor warning properties are present in dangerous concentrations. Air-purifying respirators are suitable for many laboratory applications and remove particulates (dusts, mists, metal fumes, etc.) or gases and vapors from the surrounding air.

Selection, use, and care of respirators

Follow proper procedures for selecting and using respiratory protective equipment. Correct use of a respirator is as vital as choosing the right respirator. An effective program for respiratory protection should include the following:

- Written standard operating procedures and training
- Selecting a respirator that is suitable for the application. Consult the MSDS or the Industrial Hygiene Officer before purchasing and using a respirator
- Assigning respirators to individuals for their exclusive use, whenever possible
- Fit testing: evaluation of facial fit for all users of respirators; beards, long sideburns, glasses or the wrong size of respirator may prevent an effective seal between the wearer's face and the respirator
- Protocols for using, cleaning, and sanitary storage of respirators
- Regular inspection of the respirator, and replacement of defective parts
- Medical surveillance, before an individual is assigned to work in an area where respirators are required, to verify the person's ability to function under increased breathing resistance.

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4.6 Personal Protective Equipment, Continued

Hearing Protection

Ear protection should be worn where the noise level is above 85 decibels (dBa), 8-hour time-weighted average (TWA). Areas where excessive noise is present should be posted with signs indicating ear protection is required. Ear protectors should be readily available and composed of rubber or plastic. Types of ear protection include:

- Ear plugs - provide basic protection to seal the ear against noise
- Ear muffs - provide protection against noise and may be more comfortable than ear plugs.

Training

Each laboratory worker should know the availability, location, and proper use of protective apparel and equipment. Examples include safety glasses, goggles, face shields, gloves, aprons, respirators, etc.

Records

PPE Hazard Assessment Certification Form for each employee.

4.7 Material Safety Data Sheets

Definition

The MSDS is a format for describing the characteristics and properties of chemicals and products. Each chemical or product will have a unique MSDS. For all chemicals and products used in the Materials Lab, the MSDS must be readily available. Every employee must know how to access the MSDS for the chemicals and products they use.

How to Obtain an MSDS

MSDSs must be received with each incoming shipment of hazardous material. If a MSDS is not received with the shipment, MSDSs can be obtained by calling the manufacturer or checking their website. This does not apply to chemicals and products that may come in to the Materials Lab from the field.

MSDS Storage Locations

MSDSs are stored in the following locations:

- The Chemical Hygiene Officer has a complete and updated set of MSDSs for the chemicals used at the Materials Lab
- Each Section Supervisor keeps a set of MSDSs of the chemicals used within his/her respective lab unit.

Example of MSDS

See below to better understand the contents of a MSDS. An example of a MSDS is provided in Appendix 9.

Contents of MSDS

MSDSs are the cornerstone of hazard communications standards. They provide most of the information you need to know in order to work with chemicals safely. The following information is normally contained in a MSDS:

Product Name and Identification	• Name of the chemical as it appears on the label. • Manufacturer's name and address. • Emergency telephone numbers: can be used to obtain further information about a chemical in the event of an emergency. • Chemical name or synonyms. • CAS #: refers to the Chemical Abstract Service registry number that identifies the chemical. • Date of Preparation: the most current date that the MSDS was prepared.

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4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Hazardous Ingredients/ Identity Information	• Hazardous ingredients: substances which, in sufficient concentration, can produce physical or acute or chronic health hazards to persons exposed to the product. Physical hazards include fire, explosions, corrosion, projectiles, etc. Health hazards include any health effect, even including irritation or development of allergies. • TLV: refers to the threshold limit value. A TLV is the highest airborne concentration of a substance to which nearly all adults can be repeatedly exposed, day after day, without experiencing adverse effects. These are usually based on an 8-hour TWA. • PEL: refers to the permissible exposure limit. The PEL is an exposure limit established by OSHA. • STEL: refers to the short-term exposure limit. The STEL is a 15-minute time-weighted average exposure that should not be exceeded at any time during a workday. A STEL exposure should not occur more than four times per day and there should be at least 60 minutes between exposures. • LD50 (lethal dose 50): lethal single dose (usually oral) in milligrams of chemical per kilogram of animal body weight (mg/kg) of a chemical that results in the death of 50 percent of a test animal population. • LC50 (lethal concentration 50): concentration dose expressed in parts per million (ppm) for gases or micrograms of material per liter (µg/L) of air for dusts or mists that results in the death of 50 percent of a test animal population administered in one exposure. **Note:** These terms are found in the MSDSs.
Physical/ Chemical Character-istics	Boiling point, vapor pressure, vapor density, specific gravity, melting point, appearance and odor: all provide useful information about the chemical. Boiling point and vapor pressure provide a good indication of how volatile a material is. Vapor density shows whether vapors will sink, rise, or disperse throughout the area. The further the values are from 1 (the value assigned to atmospheric air), the faster the vapors will sink or rise.

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4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Fire and Explosion Hazard Data	• Flash point: refers to the lowest temperature at which a liquid gives off enough vapor to form an ignitable mixture with air. • Flammable or Explosive Limits: the range of concentrations over which a flammable vapor mixed with air will flash or explode if an ignition source is present. • Extinguishing Media: the fire-fighting substance that is suitable for use on the substance that is burning. • Unusual Fire and Explosive Hazards: hazards that might occur as the result of overheating or burning of the specific material.
Reactivity Data	• Stability: indicates whether the material is stable or unstable under normal conditions of storage, handling, and use. • Incompatibility: lists any materials that would, upon contact with the chemical, cause the release of large amounts of energy, flammable vapor or gas, or toxic vapor or gas. • Hazardous Decomposition Products: any materials that may be produced in dangerous amounts if the specific material is exposed to burning, oxidation, heating, or allowed to react with other chemicals. • Hazardous Polymerization: a reaction with an extremely high or uncontrolled release of energy, caused by the material reacting with itself.

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4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Health Hazard Data	• Routes of Entry: inhalation - breathing in of a gas, vapor, fume, mist, or dust. Skin absorption - a possible significant contribution to overall chemical exposure by way of absorption through the skin, mucous membranes, and eyes by direct or airborne contact. Ingestion - the taking up of a substance through the mouth. Injection - having a material penetrate the skin through a cut or by mechanical means. • Health Hazards (Acute and Chronic): acute - an adverse effect with symptoms developing rapidly. Chronic - an adverse effect that can be the same as an acute effect, except that the symptoms develop slowly over a long period of time or with recurrent exposures. • Carcinogen: a substance that is determined to be cancer-producing or potentially cancer-producing. • Signs and Symptoms of Overexposure: the most common symptoms or sensations a person could expect to experience from overexposure to a specific material. It is important to remember that only some symptoms will occur with exposures in most people. • Emergency and First Aid Procedures: instructions for treatment of a victim of acute inhalation, ingestion, and skin or eye contact with a specific hazardous substance. The victim should be examined by a physician as soon as possible.
Precautions for Safe Handling and Use	• Spill Cleanup: includes methods to be used to control and clean up spills. Also includes precautions such as avoiding breathing the vapors, avoiding contact with liquids and solids, removing sources of ignition, and other important considerations. May also include special equipment used for the cleanup. • Waste Disposal Methods: acceptable and prohibited methods for disposal, as well as dangers to the environment. **Note:** These are methods recommended by the chemical manufacturer and are not necessarily in compliance with federal, state, or local regulations. For waste disposal procedures, please refer to the Chemical Waste section of this manual. • Other Precautions: any other precautionary measures not mentioned elsewhere in the MSDS.

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4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Control Measures	• Respiratory Protection: whenever respiratory protection is needed, the type required and special conditions or limitations should be listed. • Ventilation: if required, the type will be listed, as well as applicable conditions of use and limitations. • Protective Gloves: when gloves are necessary to handle the specific material, the construction, design, and material requirements should be listed. • Eye Protection: when special eye protection is required, the type will be listed along with any conditions of use and limitations. • Other Protective Equipment or Clothing: will list items not discussed elsewhere in the MSDS, such as aprons.

Training

- New employees must receive training after they are hired and prior to working with or being exposed to chemicals. This training must cover the specific hazards in their work area.
- Employees must be re-trained when new chemical hazards are introduced in their workplace or when new hazards are shown on updated MSDSs.
- Employees must be re-trained when they are assigned to different workplaces that involve new chemical hazards.
- Employees must be shown where MSDSs are kept.
- Employees must be trained and able to read and understand the information presented in the MSDS.

Records

Updated and readily accessible MSDSs
MSDS Training Records

4.8 Chemical Hazard Communication

Background

The WISHA code, WAC 296–800-170, Employer Chemical Hazard Communication Standards, requires employers to provide employees information about the potential of hazardous chemical exposure under normal use conditions or in a foreseeable emergency, and the transmittal of this information by means of a comprehensive Hazard Communication Program that includes container labeling and other forms of warning, MSDSs, and employee training.

Laboratories are required to have a written Chemical Hygiene Plan (which is incorporated in this manual) under WAC 296-62-400. A written Chemical Hazard Communication Program is not required.

Requirements

Under WAC 296-800-170, the Materials Lab is required to do the following:

- Make sure that labels on incoming containers of hazardous chemicals are in place and readable.
- Maintain MSDSs received with incoming shipments of hazardous chemicals and make them readily accessible to laboratory employees when they are in their work areas.
- Provide laboratory employees with information and training as described in: "Inform and train your employees about hazardous chemicals in your workplace," WAC 296-800-17030. You do not have to cover the location and the availability of the Hazard Communication Program.

Labels

The labeling requirements are discussed in Chapter 4.4 General Laboratory Safety.

MSDS

The MSDS requirements are discussed in Chapter 4.7 MSDS.

Training

The training requirements are discussed throughout this document and in Chapter 6, Environmental Training and Awareness.

4.9 Occupational Exposure Monitoring

Application

All employees at Materials Lab who conducts particular process or activities that require occupational exposure monitoring.

Policy

WSDOT will measure the employee's exposure to any regulated hazardous chemical if there is reason to believe that exposure levels for that chemical routinely exceed the action level or in the absence of an action level (the PEL) (WAC 296-62-40007).

Definitions

Action Level: A concentration of a specific substance calculated as an 8-hour TWA, which initiates certain required activities as designated in WAC 296-62.

Exposure: Physical contact of a person with any material (solid, liquid, or gas) or any form of energy (temperature extreme, electricity, laser, ionizing or non-ionizing radiation, etc.).

Permissible Exposure Level (PEL): The maximum concentration of a contaminant in breathing air to which a laboratory worker may be legally exposed, as an 8-hour TWA.

When Monitoring is Required

Representative air monitoring is mandatory for some chemicals because they are regulated by substance-specific health standards. Of these, inorganic arsenic, lead, and benzene are regularly used at the Materials Lab. If the action level is exceeded, the Materials Lab will immediately comply with the exposure monitoring requirements of the standard for that substance (WAC 296-62-075 through 296-62-07515).

In addition, environmental monitoring of airborne concentrations of hazardous chemicals should be conducted in the following conditions:

- When requested by a laboratory employee as a result of a documented health concern or suspicion that a PEL is being exceeded, or
- When a highly toxic substance is being regularly and continuously used outside of a chemical fume hood (three or more times a week).

Routine Air Monitoring

Routine monitoring of exposure levels in the laboratory will be conducted if determined to be necessary by the Office of the Safety and Health.

Records

Exposure testing procedures and monitoring result will be maintained in the Safety and Health Services Office. All exposure testing results will be provided to the Section Supervisor and participating employees.

4.10 Medical Consultation and Examination

Policy

Laboratory personnel that believe or suspect they have sustained an injury or illness from exposure to chemicals or products at the Materials Lab must immediately seek medical attention. All medical costs for this scenario will be the responsibility of WSDOT.

When Medical Attention Will be Provided

Medical attention, including medical consultation and follow-up, is provided to employees under the following circumstances:

- Where exposure monitoring is over the action level for a regulated substance that has medical surveillance requirements
- Whenever a laboratory employee develops signs or symptoms that may be associated with a hazardous chemical to which the employee may have been exposed in the laboratory
- Whenever a spill, leak, or explosion results in the likelihood of a hazardous exposure.

Reproductive Hazards

As determined by a licensed and practicing physician, for those individuals, male or female, who are actively trying to conceive a child, or females who are pregnant, special care may be required in evaluating possible exposure to chemicals and products that are know or may be reproductive hazards. It is the responsibility of the employee and supervisor to put together a detailed list of these chemicals and products routinely or potentially used at the Materials Lab. In addition, a detailed job description shall be provided to the examining physician. The physician in writing shall submit his/her opinion regarding the potential reproductive hazards and any reasonable accommodation or work activity changes.

Note: Physician costs for potential or real chemical and product injuries or illness are the responsibility of WSDOT.

Information to be Provided to the Examining Physician

For chemical and project related injuries or illnesses when medical consultations or examinations are provided, the examining physician will be provided with the following information:

- The identity of the hazardous chemical(s) or products(s) to which the employee(s) is or may be exposed to as part of his/her routine work activities
- The MSDSs for the hazardous chemical(s) and product(s) if available
- A description of the conditions under which the exposure occurred, including quantitative exposure data if available
- A description of the signs and symptoms of exposure that the employee is experiencing, if any
- Any other information that the physician may request.

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4.10 Medical Consultation and Examination, Continued

Written Opinion Provided by the Examining Physician

For examinations or consultations provided to employees, the Safety and Health Services Office shall obtain a written opinion from the examining physician. It shall include:

- Recommendations for further medical follow-up
- Recommendations for reasonable accommodations or light duty work
- Results of the examination and associated tests
- Any medical condition revealed that places the employee at an increased risk of exposure to a hazardous substance found in the workplace
- A statement that the employee has been informed of the results of the examination or consultation

Note: The written opinion will not reveal specific diagnoses unrelated to occupational exposure, except as noted above.

Employee Exposure and Medical Records

OSHA regulation 29 CFR 1910.20, Access to Employee Exposure and Medical Records, addresses the storage and access to employee exposure and medical records pertaining to toxic substances or harmful physical agents. The following is a summary of this regulation:

- The medical record for each employee is to be preserved and maintained for at least the duration of employment plus 30 years.
- Each employee exposure record shall be preserved and maintained for at least 30 years.
- Each analysis using employee exposure or medical records shall be preserved and maintained for at least 30 years.
- MSDSs and other descriptions of substances do not have to be retained, as long as some record of the identity (chemical name if known) of the substance or agent, where it was used, and when it was used is retained for 30 years.

All WSDOT personnel medical records are maintained in the Safety and Health Services Office. Under no circumstances will non-authorized personnel have access to employee medical records. Under no circumstances are Section Supervisors or employees to keep medical records at the Materials Lab.

If an employee or their designated representative requests a copy of the employee's health record, the Safety and Health Services Office is to provide a copy within 15 days of the request.

Records

Employee Exposure and Medical Records must be preserved and maintained for at least the duration of employment plus 30 years.

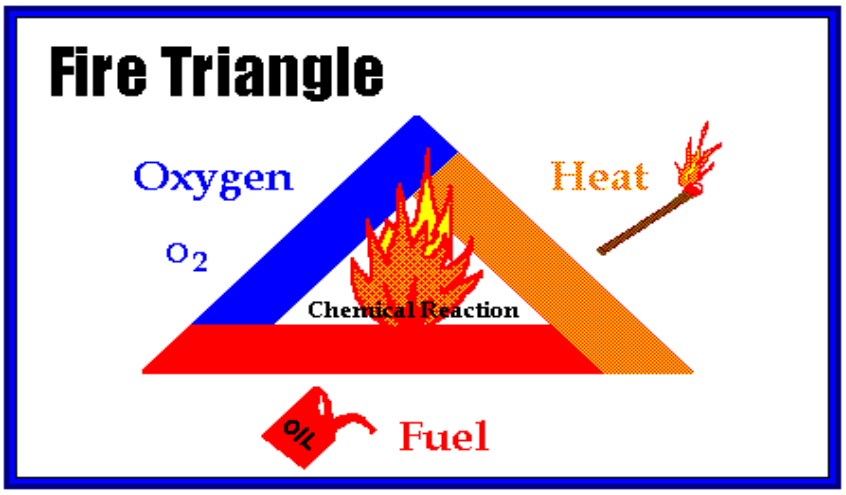
4.11 Fire Safety

Fire Safety

Laboratory fires can be caused by Bunsen burners, runaway chemical reactions, electrical heating units, failure of unattended or defective equipment, or overloaded electrical circuits.
Familiarize yourself with the operation of the fire extinguishers and the location of pull stations, emergency exits, and evacuation routes where you work. If the general alarm is sounded, use the evacuation routes established for your area and follow the instructions of the Wing Commanders. Once outside of the building, follow the procedures established in the Materials Lab Evacuation Plan.

Fire Triangle

Fire cannot occur without an ignition source, fuel, and oxygen, the three elements that comprise what is called the "fire triangle:"



Classes of Fire

The NFPA has four defined classes of fire, according to the type of fuel involved. These are:

Class	Description
A	Class A fires involve combustibles such as paper, wood, cloth, rubber and many plastics.
B	Class B fires entail burning of liquid fuels such as oil-based paints, greases, solvents, oil and gasoline.
C	Class C fires are of electrical origin (fuse boxes, electric motors, wiring)
D	Class D fires encompass combustible metals such as magnesium, sodium, potassium and phosphorus.

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4.11 Fire Safety, Continued

Fire Extinguishers

Fire extinguishers are rated as A, B, C or D (or combinations of A, B, C and D) for use against the different classes of fires. Familiarize yourself with the fire class ratings of the extinguishers in your work area so that you will know what types of fire you can attempt to extinguish with them.
Learn how to use the extinguisher in your lab, because there will be no time to read instructions during an emergency. Attempt to fight small fires only, and only if there is an escape route behind you. Remember to have the extinguisher recharged after every use. If you do fight a fire, remember the acronym "PASS" when using the extinguisher:
P: Pull and twist the locking pin to break the seal.
A: Aim low, and point the nozzle at the base of the fire.
S: Squeeze the handle to release the extinguishing agent.
S: Sweep from side to side until the fire is out.
Be prepared to repeat the process if the fire breaks out again

Prevention Fires

Use the following precautions when working with or using flammable chemicals in a laboratory. Keep in mind that these precautions also apply to flammable chemical waste.

- Minimize the quantities of flammable liquids kept in the laboratory.
- Except for the quantities needed for the work at hand, keep all flammable liquids in NFPA- or Underwriter's Laboratories- (UL) approved flammable liquid storage cabinets. Keep cabinet doors closed and latched at all times. Do not store other materials in these cabinets.
- Use and store flammable liquids and gases only in well-ventilated areas. Use a fume hood when working with products that release flammable vapors.
- Keep flammable solvent containers, including those for collecting waste, well-capped. Place open reservoirs or collection vessels for organic procedures such as HPLC inside vented chambers.
- Store flammable chemicals that require refrigeration in "explosion-safe" (non-sparking) laboratory refrigerators.
- Keep flammable chemicals away from ignition sources such as heat, sparks, flames and direct sunlight. Avoid welding or soldering in the vicinity of flammables.
- Bond and ground large metal containers of flammable liquids in storage. To avoid the build-up of static charges, bond containers to each other when dispensing.
- Use portable safety cans for storing, dispensing, and transporting flammable liquids.
- Clean spills of flammable liquids promptly.

Continued on next page

4.11 Fire Safety, Continued

Fire Response Procedures

Fires are a common emergency in a chemistry laboratory. In the event of a fire, do the following:

Step	Action
1	Assist any person in immediate danger to safety, if it can be accomplished without risk to yourself.
2	Immediately activate the building fire alarm system.
3	If the fire is small enough, use a nearby fire extinguisher to control and extinguish the fire. Don't fight the fire if these conditions exist: - The fire is too large or out of control - The atmosphere is toxic
4	If the first attempts to put out the fire do not succeed, evacuate the building immediately.
5	Doors and, if possible, windows, should be closed as the last person leaves a room or area of a lab.
6	Do not use elevators; use building stairwells.
7	When the fire alarm sounds, all personnel in the affected areas shall evacuate the building immediately.
8	Upon evacuating the building, personnel shall proceed to the designated meeting area where the Wing Commanders are responsible for taking a head count and accounting for all personnel.
9	No personnel will be allowed to re-enter the building without the permission

4.12 Medical Emergency Including Injury or Illnesses

Medical Emergency Response Procedures

Personal injury is not uncommon in laboratories. These injuries are usually minor cuts or burns but can be as severe as acute effects of chemical exposure, or incidents such as heart attacks or strokes.

The procedures for responding to medical emergence are as follows:

- The names of persons in your area trained in CPR and First Aid should be posted by your telephone.
- The number to call for medical emergencies (**911**) should also be posted by your telephone.
- All first aid, chemical exposures, and medical emergencies should be reported.
- In the event of an injury or illness resulting in hospitalization, lost work days, and filling a claim with the WA State Department of Labor and Industries, employees and supervisors are required to complete WSDOT form 750-002.

Step	Action
1	The initial responsibility for first aid rests with the first person(s) at the scene, who should react quickly but in a calm and reassuring manner.
2	Summon medical help (be explicit in reporting suspected types of injury or illness, location of victim, and type of assistance required).
3	Send people to meet the ambulance crew at likely entrances of the building.
4	The injured person should not be moved except where necessary to prevent further injury.

General First Aid

First aid is defined as any one-time treatment and any follow-up visit for the purpose of observation or treatment of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Prevention of injuries should be a major emphasis of any laboratory safety program. Proper training will help prevent injuries from glassware, toxic chemicals, burns and electrical shock. In the event of any type of injury beyond that which first aid can treat, call 911 for medical assistance.

The following general first aid guidelines should be followed:

- First aid equipment should be readily available in each laboratory. .
- Following any first aid, a nurse or physician qualified to handle chemical emergencies should provide further examination and treatment. The location and phone number of emergency services and the State of Washington Poison Control Center (1-800-222-1222) should be clearly posted.

Continued on next page

4.12 Medical Emergency Including Injury or Illnesses, Continued

General First Aid (continued)

- It is recommended that each laboratory have at least one person trained in basic first aid and cardiopulmonary resuscitation.
- Someone knowledgeable about the accident should always accompany the injured person to the medical facility, and a copy of any appropriate MSDS(s) shall accompany the victim.
- Minor injuries requiring first aid should always be reported to a supervisor and recorded on the Accident Report Form (WSDOT Form 750-010) (Appendix 10.)

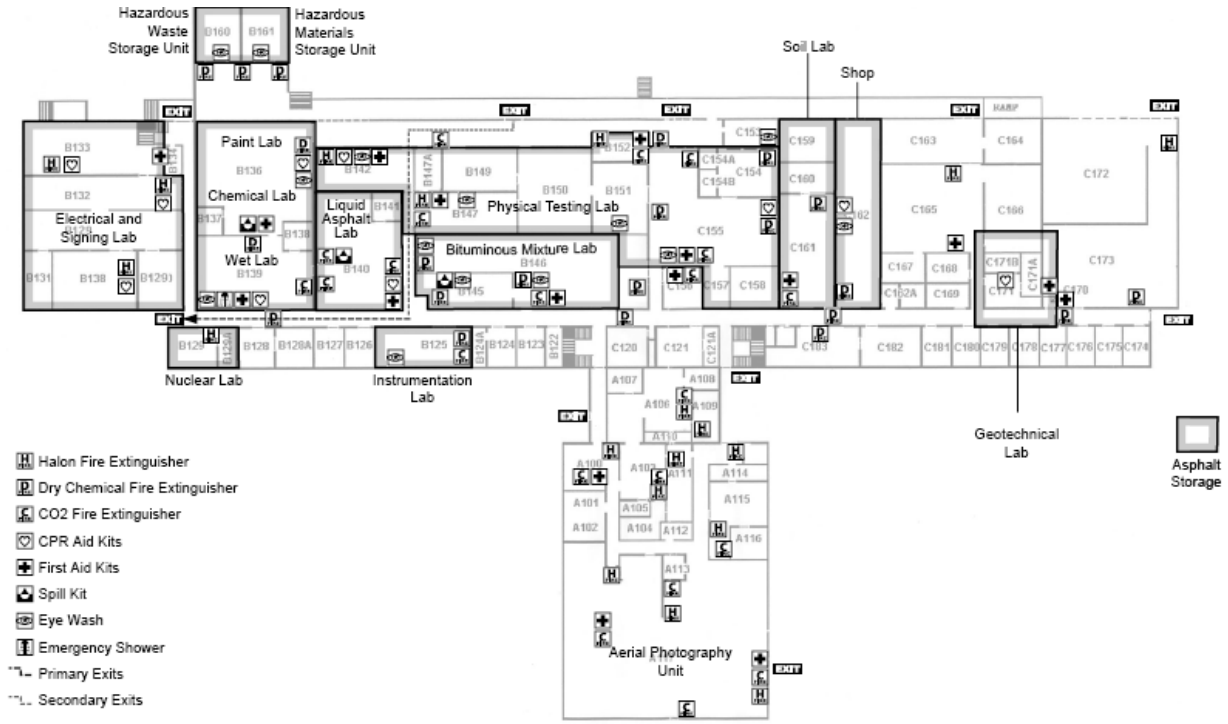
Reasons for this are as follows:

– A minor injury may indicate a hazardous situation which should be corrected to prevent a serious future injury.

It is important to document a minor injury as having been "work related" if the injury later leads to serious complications, such as from an infected cut.

First Aid Kits

The locations of first aid kits are shown below.



Emergency Response Equipment

Continued on next page

4.12 Medical Emergency Including Injury or Illnesses, Continued

Personal Protection During First Aid

OSHA requires adherence to "Universal Precautions" when employees respond to emergencies that involve potential exposure to blood and other potentially infectious materials. "Universal Precautions" stresses that all patients should be assumed to be infectious for human immunodeficiency virus (HIV) and other bloodborne pathogens.

Persons responding to a medical emergency should be protected from exposure to blood and other potentially infectious materials. Protection can be achieved through adherence to work practices designed to minimize or eliminate exposure, and through the use of PPE (that is, gloves, masks, and protective clothing), which provides a barrier between the worker and the exposure source. For most situations in which first aid is given, the following guidelines should be adequate:

- For bleeding control with minimal bleeding and for handling and cleaning instruments with microbial contamination, disposable gloves alone should be sufficient.
- For bleeding control with spurting blood, disposable gloves, a gown, a mask, and protective eye wear are recommended.
- For measuring temperature or measuring blood pressure, no protection is required.

After emergency care has been administered, hands and other skin surfaces should be washed immediately and thoroughly with warm water and soap if contaminated with blood, other body fluids to which Universal Precautions apply, or potentially contaminated articles. Hands should always be washed after gloves are removed, even if the gloves appear to be intact.

Accident Report Form

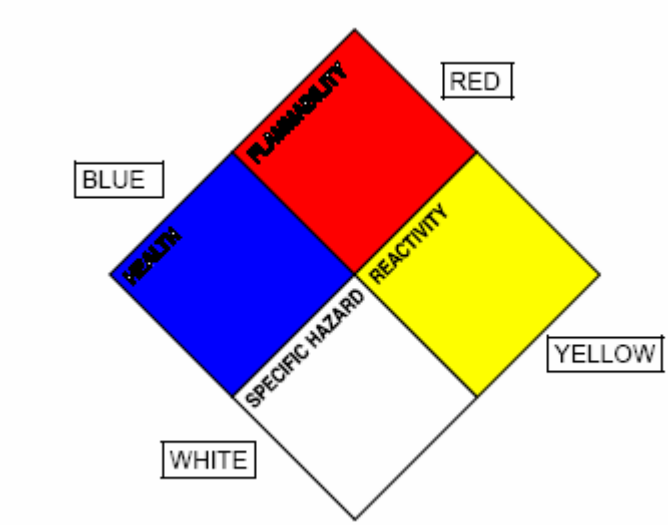
An Accident Report Form should be completed for each accident. The Accident Report Form (WSDOT Form 750-010) is located in Appendix 10.

4.13 NFPA Hazard Codes

NFPA Hazard Codes

Most manufacturers of hazardous materials use the standard National Fire Protection Association (NFPA) sign system. The sign is based on a simple color coding and numbering system (0 - 4) on a diamond-shaped placard.

NFPA Placard



Hazard Rating

The following is a description of the color coding (hazard category) and hazard rating:

Hazard Category	Hazard Rating
Health (Blue)	**4** Deadly: Even the slightest exposure to this substance could be life-threatening. Only specialized protective clothing, designed for these materials, should be worn. **3** Extreme Danger: Serious injury would result from exposure to this substance. Do not expose any body surface to these materials. Full protective measures should be taken. **2** Dangerous: Exposure to this substance would be hazardous to health. Protective measures are indicated. **1** Slight Hazard: Irritation or minor injury would result from exposure to this substance. Protective measures are indicated. **0** No Hazard: Exposure to this substance offers no significant risk to health.

Continued on next page

4.13 NFPA Hazard Codes, Continued

Hazard Rating (continued)

Hazard Category	Hazard Rating
Flammability (Red)	**4** Flashpoint Below 73 degree F: This substance is very flammable, volatile, or explosive depending on its state. Extreme caution should be used in handling or storing these materials. **3** Flashpoint Below 100 degree F: Flammable, volatile or explosive under almost all normal temperature conditions. Exercise great caution in storing or handling these materials. **2** Flashpoint Below 200 degree F: Moderately heated conditions may ignite this substance. Caution should be employed in handling. **1** Flashpoint Above 200 degree F: This substance must be preheated to ignite. Most combustible solids are in this category. **0** Will Not Burn: Substances that will not burn.
Reactivity (Yellow)	**4** May Detonate: Substances that are readily capable of detonation or explosion at normal temperatures and pressures. Evacuate area if material is exposed to heat or fire. **3** Explosive: Substances that are readily capable of detonation or explosion by a strong initiating source, such as heat, shock, or water. Monitor from behind explosion-resistant barriers. **2** Unstable: Violent chemical changes are possible at normal or elevated temperatures and pressures. Potentially violent or explosive reaction may occur when mixed with water. Monitor from a safe distance. **1** Normally Stable: Substances that may become unstable at elevated temperatures and pressures, or when mixed with water. Approach with caution. **0** Stable: Substances will remain stable when exposed to heat, pressure, or water.
Special Hazards (White)	This space is used to place codes or icons to identify additional hazards not covered by the three major categories above. **Examples may include:** **C** Chronic Health **W** Water-reactive **X** Oxidizer

Continued on next page

4.13 NFPA Hazard Codes, Continued

Signage

The NFPA system is used for posting in buildings and storage areas, including cabinets. Laboratory labels should:

- Be posted at the entrance to provide adequate warning for personnel entering the room. This is particularly important for emergency response personnel who need to have a knowledge of what is stored in the room.
- Indicate the basic PPE requirements.
- Refrigerators must have a label indicating whether they are approved for the storage of flammable materials.
- Locations of fire extinguishers must be clearly posted
- Exit door(s) must have a clear exit sign (with emergency power supply).

4.14 Procedures for Carcinogens, Reproductive Toxins, Substances with High Acute or Unknown Toxicity

Background

In accordance with the requirements of the Chemical Hygiene Plan (WAC 296-62-40009(h)), when performing laboratory work with carcinogen, reproductive toxin, substances that has a high degree of acute toxicity, or a chemical whose toxic properties are unknown, the following procedures apply. For the purpose of this document, these chemicals are referred to as "inimical" chemicals

Confirmed or Suspected Human Carcinogens, and Extremely Hazardous Substances

The following are the Occupational Safety and Health Administration (OSHA) -listed Confirmed or Suspected Carcinogens and Extremely Hazardous Substances used by the Materials Lab. A full list of carcinogens is included in Appendix 4.

Note: the Materials Lab may not necessarily use these substances at concentrations that meet the criteria established for using carcinogens (e.g., more than 0.1% of a given carcinogen). Therefore the following control measures may not apply.

Confirmed or Suspected Carcinogens	CAS #
Inorganic Arsenic	7440-38-2
Lead	7439-92-1
Benzene	71-43-2
Formaldehyde	50-00-0
Extremely Hazardous Substances	**CAS #**
Perchloric Acid	7601-90-3
Hydrofluoric Acid	7664-39-3

Control Measures

Inimical chemicals must be handled in a "designated area," which is defined by OSHA as a hood, portion of a laboratory, or the entire lab. Designated areas shall be posted and their boundaries clearly marked. Only those persons trained to work with inimical chemicals will work with those chemicals in a designated area. All such persons will:

- Use the smallest amount of the chemical that is consistent with the requirements of the work to be done.
- Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps.
- Decontaminate the designated area when work is completed.

Continued on next page

4.14 Procedures for Carcinogens, Reproductive Toxins, Substances with High Acute or Unknown Toxicity, Continued

Control Measures (continued)

- Prepare wastes from work with inimical chemicals for waste disposal in accordance with specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA) as determined by the Chemical Hygiene Plan. Refer to Chapter 3 for hazardous waste handling procedures.

Because the decontamination of jewelry may be difficult or impossible, jewelry on the hands or wrists cannot be worn when working in a designated area.

Long-sleeved clothing and gloves known to resist permeation by the chemicals will be worn when working in designated areas.

Store all inimical chemicals in locked and enclosed spaces with a slight negative pressure compared to the rest of the laboratory.

The user of these chemicals will keep a record of the chemicals removed from this storage area and check to make sure they are handled properly in the designated area.

Use commercially prepared standards that are below the threshold concentrations instead of preparing standards from neat chemicals.

Criteria for Select Carcinogens

A substance with more than 0.1% of a chemical which meets one of the following criteria.

- It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or
- It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or,
- It is regulated as a carcinogen by OSHA.

A list of carcinogens is included in Appendix 4.

Criteria for Reproductive Toxins

A mixture with greater than 1.0% of any substance described as a reproductive toxin in the applicable MSDS.

Criteria Substances with a High Degree of Acute Toxicity

A substance with more than 1.0% of a chemical which meets one of the following criteria

- A chemical that has a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to albino rats weighing between 200 and 300 gm each.

Continued on next page

4.14 Procedures for Carcinogens, Reproductive Toxins, Substances with High Acute or Unknown Toxicity, Continued

Criteria Substances with a High Degree of Acute Toxicity (continued)

- A chemical that has a median lethal dose (LD50) of 200 mg or less per kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kg each.

A chemical that has a median lethal concentration (LC50) in air of 200 ppm by volume or less of gas or vapor, or 2 mg/L or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 gm each.

Criteria for Chemicals with Unknown Toxicity

A chemical for which there is no known statistically significant study conducted in accordance with established scientific principles that establishes its toxicity.

Chapter 5 Inspection and Monitoring

5.1 Overview

Introduction

Preventive maintenance, including inspections and monitoring, is a crucial part of ensuring health and safety in the laboratory environment. Lab supervisors and personnel should routinely conduct inspections. Documented inspections are to be conducted on a weekly, monthly, and annual basis. This section describes the recommended laboratory inspection process and schedule.

Contents

This section contains the following topics:

Topic	See Page
5.2 Inspection of Hazardous Material and Waste Storage Units (B160 and B161)	5-2
5.3 Inspection of Satellite Hazardous Material and Waste Storage Areas	5-4
5.4 Laboratory Safety Equipment Inspections	5-6
5.5 Annual Laboratory Safety Inspection	5-8
5.6 Chemical Inventory Management	5-10

5.2 Inspection of Hazardous Material and Waste Storage Units (B160 and B161)

Requirement

The hazardous material and the waste storage areas must be inspected on a biweekly basis to identify and promptly respond to potential hazards associated with long- and short-term hazardous material/waste storage, including container leakage. The results of the inspection and any corrective actions must be documented on the Hazardous Material/Dangerous Waste Storage Area/Unit Inspection Form.

Application

This procedure applies to the hazardous material and waste storage units (B160 and B161).

Responsibility

The hazardous material and waste storage unit inspections are performed by the Laboratory Supervisors.

Inspection Frequency

The hazardous material and waste storage areas should be inspected on a biweekly basis.

Inspection Form

A copy of the Hazardous Material/Dangerous Waste Storage Area/Unit Inspection Form is contained in the Appendix 11.

Procedure

The procedure for inspecting the hazardous material and waste storage areas is as follows:

Step	Action
1	Conduct biweekly inspection.
2	Note any deviations, problems, and corrective action needed/taken.
3	Make sure that any deficiencies you find are corrected immediately and are documented in the inspection form.
4	Sign and date form.
5	Place the completed inspection form in your records.

Continued on next page

5.2 Inspection of Hazardous Material and Waste Storage Units (B160 and B161), Continued

Addressing Nonconformity

Upon inspection, if deficiencies are noted, conduct the following:

Step	Action
1	Correct deficiency as soon as possible.
2	Document the correction on the inspection form.
3	Implement appropriate actions to avoid their recurrence, such as informing the responsible party, providing additional training, and instituting additional safeguards.

Training

The person performing the inspection should be trained in this inspection procedure and should be familiar with the requirements related to hazardous material and waste storage.

Record

The completed Hazardous Material/Dangerous Waste Storage Area/Unit Inspection Forms must be kept in records for at least 3 years.

5.3 Inspection of Satellite Hazardous Material and Waste Storage Areas

Requirement

The satellite hazardous material and waste storage areas must be inspected on a quarterly basis to identify and promptly respond to potential hazards associated with long- and short-term hazardous material/waste storage, including container leakage, proper segregation, etc. The results of the inspection and any corrective actions taken must be documented on the Hazardous Material/Dangerous Waste Storage Area/Unit Inspection Form.

Application

This procedure applies to laboratory units that have satellite storage of hazardous materials and wastes. These include:

- Chemistry Lab
- Liquid Asphalt Lab
- Bituminous Mixtures Lab
- Physical Testing Lab
- Facility and Building Maintenance

Responsibility

The inspection of satellite hazardous material and waste storage areas located in individual lab units is performed by the Laboratory Supervisors.

Inspection Frequency

Quarterly

Inspection Form

A copy of the Satellite Hazardous Material and Waste Storage Area Inspection Form is contained in Appendix 11.

Procedure

The procedure for inspection of the satellite hazardous material and waste storage areas is as follows:

Step	Action
1	Conduct quarterly inspection.
2	Note any deviations, problems, and corrective action needed/taken.
3	Make sure that any deficiencies you find are corrected immediately and are documented in the inspection form.
4	Sign and date form.
5	Place the completed inspection form in your records.

Continued on next page

5.3 Inspection of Satellite Hazardous Material and Waste Storage Areas, Continued

Addressing Nonconformity

Upon inspection, if deficiencies are noted, conduct the following:

Step	Action
1	Correct the deficiency as soon as possible.
2	Document the correction on the inspection form.
3	If appropriate, implement appropriate actions to avoid their recurrence, such as informing the responsible party, providing additional training, and instituting additional safeguards.

Training

The person performing the inspection should be trained in this inspection procedure and should be familiar with the requirements related to hazardous material and waste storage in satellite storage areas.

Record

Completed Satellite Hazardous Material and Storage Area Inspection Log. Log must be kept in records for at least 3 years.

5.4 Laboratory Safety Equipment Inspections

Requirement

PPE is to be inspected before each use. Other safety equipment such as, showers, eyewash stations, fire extinguishers, spill kits, first aid kits and fume hoods shall be inspected quarterly. Document all safety equipment inspections.

Application

This procedure applies to all laboratory units.

Responsibility

The inspection of safety equipment and other miscellaneous items is performed by the Lab Supervisor.

Inspection Frequency

quarterly

Inspection Form

A copy of the Monthly Laboratory Safety Equipment Checklist is contained in the Appendix 11.

Procedure

The inspection procedures are as follows:

Step	Action
1	Conduct quarterly inspection.
2	Note any deviations, problems, and corrective action needed/taken.
3	Make sure that any deficiencies you find are corrected immediately and are documented in the inspection form.
4	Sign and date form.
5	Place the completed inspection form in your records.

Continued on next page

5.4 Laboratory Safety Equipment Inspections, Continued

Addressing Nonconformity

Upon inspection, if deficiencies are noted, conduct the following:

Step	Action
1	Correct deficiency as soon as possible.
2	Document the correction on the inspection form.
3	Implement appropriate actions to avoid their recurrence, such as informing the responsible party, providing additional training, and instituting additional safeguards.

Training

The person performing the inspection should be trained in this inspection procedure and should be familiar with the proper operation of laboratory safety equipment.

Record

Completed Monthly Laboratory Safety Equipment Checklist. Form must be kept for at least 3 years.

5.5 Annual Laboratory Safety Inspection

Requirement

The annual comprehensive laboratory safety inspection must be conducted by the Administrative Officer, Laboratory Safety Committee member, the Chemical Hygiene Officer, personnel from the Safety and Health Services Office, applicable lab supervisors, and facility managers. The State Materials Engineer will be provided a copy of the annual report for his/her signature and/or any follow-up action items.

Application

This procedure applies to all laboratory units, as well as Facilities and Equipment Management Operations.

Inspection Frequency

Annually

Inspection Form

A copy of the Annual Laboratory Safety Inspection Checklist is contained in the Appendix 11.

Procedure

The inspection procedures are as follows:

Step	Action
1	The annual inspection will be schedule in advance for maximum participation.
2	Note any deviations, problems, and corrective action needed/taken.
3	Make sure that any deficiencies you find are corrected immediately and are documented in the inspection form.
4	Sign and date form.
5	Forward the inspection form to WSDOT Materials Engineer for signature.

Continued on next page

5.5 Annual Laboratory Safety Inspection, Continued

Addressing Nonconformity

Upon inspection, if deficiencies are noted, conduct the following:

Step	Action
1	Correct deficiency as soon as possible.
2	Document the correction on the inspection form.
3	Implement appropriate actions to avoid their recurrence, such as informing the responsible party, providing additional training, and instituting additional safeguards.

Training

The person performing the inspection should be trained in this inspection procedure and should be familiar with all facets of laboratory operations and health and safety requirements.

Record

Completed Annual Laboratory Safety Inspection Checklist. Must be kept for at least 5 years.

5.6 Chemical Inventory Management

Requirement

In accordance with the requirements of the IFC and NFPA code, a chemical inventory is to be maintained.

Application

All laboratory units that handle or store hazardous materials and chemicals.

Responsibility

The Chemical Hygiene Officer is responsible for maintaining Chemical Inventory for the entire facility. Each Section Supervisor or his/her designee is responsible for providing the information required to maintain the Chemical Inventory for his/her respective lab unit.

Frequency

The Chemical Inventory is to be maintained on an ongoing basis.

Procedure

The procedures for maintaining the chemical inventory are as follows:

Step	Action
1	Upon receipt of a new chemical from an outside source, the laboratory supervisor or employee must add the new MSDS to the list and keep a Chemical Inventory.

Continued on next page

5.6 Chemical Inventory Management, Continued

Procedure (continued)

Step	Action
	•
4	Check to see if the new chemicals are stored in their proper location (that is, segregated by hazard class), have adequate ventilation, etc.
	•
6	Provide the information to the Chemical Hygiene Officer. The Chemical Hygiene Officer updates the chemical inventory.
7	Chemical Hygiene Officer verifies that a MSDS is available for each chemical.

Training

All Section Supervisors must be aware of this policy. The person conducting the annual inventory check must also be aware of proper chemical storage, handling, and disposal procedures.

Record

The chemical inventory must be updated on an on-going.

Chapter 6 Communication, Nonconformity, Corrective and Preventive Actions, Environmental Performance

6.1 Overview

Introduction

Elements of the EMS, including communication, nonconformity, corrective and prevention actions, and environmental performance are presented in this chapter.

Contents

This section contains the following topics:

Topic	See Page
6.2 Internal Communication	6-2
6.3 External Communication	6-5
6.4 Nonconformity, Corrective Action, and Preventive Action	6-6
6.5 Environmental Performance	6-7

6.2 Internal Communication

Background

Effective communication with both internal and external stakeholders is an essential component of the WSDOT EMS. Internal and external communication is used to disseminate information relevant to the EMS and its requirements, and WSDOT environmental compliance and performance. Additionally, it is critical to implement systems that allow key stakeholders, both internal and external, to provide recommendations or comments regarding WSDOT's EMS or this EMP. This input is important for establishing or revising environmental practices.
Systems are in place to provide information about the EMS and for WSDOT to receive, document, and respond to relevant inquiries or comments from staff.

Application

This procedure applies to all Materials Lab staff.

Policy

Through effective internal communication, WSDOT is committed to increasing employee awareness, understanding, cooperation, involvement, and ownership of key environmental aspects associated with the day-to-day and long-term compliant operation of the Materials Lab.

Means of Internal Communication

Internal communication is accomplished at WSDOT through both formal and informal means. Formal internal communication includes Employee Orientation, training, meetings, and Reports. Informal internal communication includes electronic mail and open discussion. Each of these means of communication are further discussed below:

Communication	Function
Employee Orientation	New employees at the Materials Lab will receive basic awareness orientation training that includes the following: • Legal requirements, roles and responsibilities • Operating policies and procedures • Opportunities to obtain more information or formal training • Contents of this Environmental Health and Safety Manual • Hazard communication • Basic lab safety

Continued on next page

6.2 Internal Communication, Continued

Means of Internal Communication (continued)

Communication	Function
Meetings	Meetings are employee gatherings that normally follow a specific agenda and may have minutes prepared. Meetings are formal methods of directly communicating information and can be held for a variety of purposes, including coordinating job-related activities, conducting strategic planning, and discussing critical health and safety awareness issues. Examples of internal meetings at the Materials Lab include: • Safety meetings where employees and management discuss safety-related incidents and practices in order to promote awareness and foster a safer work environment • Section and staff meetings, where team members gather to coordinate job-related activities • Leadership meetings where senior management discuss, organize, and plan activities related to planning and environmental compliance.
Reports	Reports are formal written documents prepared to communicate specific ideas, information, or topics. Reports are used to provide periodic updates, communicate required or requested information, or present a plan of action.
Bulletin Boards	Facility personnel can view Materials Lab announcements on bulletin boards. Bulletin boards are also used to convey labor law and safety-related communications. Employees are encouraged to view the bulletin boards periodically and are held accountable for the information posted.
Electronic Mail	Materials Lab personnel use electronic mail to quickly convey and share information (for example, reports, notices, announcements, etc), and schedule and confirm meetings.
Open Discussion	Open discussion is direct communication between employees and is used as a first choice for conveying information. Open discussion is encouraged between all employees to communicate and share ideas and information.

Continued on next page

6.2 Internal Communication, Continued

Training	Lab employees will be informed of this policy during the Environmental Health and Safety Manual Training course.
Records	Records of training will be maintained in the WSDOT Automated Training Management System (ATMS).

6.3 External Communication

Background

Effective communication with both internal and external stakeholders is an essential component of the WSDOT EMS. Internal and external communications are used to disseminate information relevant to the EMS and its requirements, and WSDOT environmental compliance and performance. Additionally, it is critical to implement systems that key stakeholders, both internal and external, can use to provide recommendations or comments regarding WSDOT EMS or this EMP. This input is important for establishing or revising environmental practices.

Systems are in place to provide information about the EMS and for WSDOT to receive, document, and respond to relevant inquiries or comments from staff and the public related to environmental performance or the EMS.

As part of its overall EMS implementation, WSDOT has developed a system to communicate with other interested parties outside the agency.

Application

This procedure applies to all Materials Lab staff who receive and distribute information related to environmental management between the Materials Lab and external interested parties.

External Interested Parties

Stakeholders such as WSDOT customers, regulatory agencies, environmental groups, and the public.

Policy

WSDOT is committed to providing timely responses to external queries or requests for information. Responses will be provided in accordance with the WSDOT Communication Policies. Any questions should be forwarded to the Lab Administrative Officer for handling.

Procedure

Refer to the WSDOT Communications Office for guidance.

Training

Lab employees will be informed of this policy.

Records

Records of external communication will be maintained by the Lab Administrative Officer.

6.4 Nonconformity, Corrective Action, and Preventive Action

Background

As part of its EMS implementation, WSDOT has developed a process by which deviations from the EMS or difficulties in implementing the EMS can be identified and corrected.

Application

It is the responsibility of all Lab employees involved with the implementation of the EMS to follow the "Nonconformance and Corrective and Preventive Action" procedures to report any EMS problems or improvement opportunities. Knowledge of various problems or improvement opportunities could come about through internal audits, external audits, environmental incidents, complaints, inspections, failures to meet objectives and/or targets, preventive action suggestions, and other employee input.

Definitions

The terms non-conformance and non-compliance are defined as follows:

- Non-conformance: Any deviation from established procedures, programs, and other arrangement related to the EMS. It may include non-compliance with regulations, but not every situation of non-compliance is necessarily non-conformance with the EMS. An EMS audit (internal or third-party) makes findings of non-conformance.
- Non-compliance: Failure to meet regulatory or other requirements that have been imposed on the Materials Lab. A compliance audit makes findings of non-compliance.

Policy

All employees will inform their supervisor of environmental issues or concerns (for example, faulty or unsafe process, suggested improvements to the process, etc.). If appropriate, employees will submit a Corrective and Preventive Action Request Form. Whenever a compliance assurance procedure is triggered, that procedure shall be followed.

Corrective Action Procedure

Implement appropriate actions to avoid their recurrence, such as informing the responsible party, providing additional training, and instituting additional safeguards.

Training

Lab employees will be informed of this policy during the periodic staff and/or safety meetings.

Records

Records of corrective actions or recommendations and the actions taken with regard to each will be maintained by the WSDOT Materials Engineer.

Chapter 7 Environmental Training and Awareness

7.1 Environmental Training Program

Background

A critical element for the successful implementation of the Materials Lab Environmental Management Program (EMS) is the development and implementation of an environmental health and safety (EH&S) training program. A comprehensive training program provides the following:

- Employees are given information on procedures to conduct their work in acceptance with environmental health and safety and fire code requirements.
- A mechanism is available to demonstrate management's commitment to improved environmental performance, communicate corporate environmental policies and goals, and elevate the environmental awareness of staff.

Application

The training section applies to all Materials Lab employees.

Policy

The policy of the Materials Lab is to ensure that all personnel have the training, commensurate with their responsibilities, as required to protect their health and to perform work in a competent, safe, and environmentally sound manner. The training standards will meet or exceed the requirements of the Ecology, U.S. DOT, WISHA, and other regulatory agencies. The Materials Lab will provide all training needed to enable its workers to meet those standards, and it will document the training of all its personnel.

Training Program Overview

The training program provides employees with the training necessary for the safe and productive completion of their work responsibilities. A primary emphasis is placed on the fulfillment of environmental health and safety training requirements. The training program will include the following courses:

- Hazardous Communications Training (WSDOT Safety Office)
- Hazardous Materials Handling (Video)
- On the job training (performed by laboratory supervisors on safety and handling procedures for chemicals and wastes related to specific testing procedures)

Continued on next page

7.1 Environmental Training Program, Continued

Needs Assessment Process

At the heart of the training program is the Needs Assessment Process. The Needs Assessment Process provides a mechanism to identify hazards, training needs, and job task elements. The following steps should be followed to identify training needs:

Step	Action
1	For each employee, the Section Supervisor completes the Laboratory Employee Training and Awareness Checklist.
2	Each employee's training needs are determined by the employee and their supervisor, who ensure that mandatory requirements are met, as well as professional development needs. One tool to determine employee's training needs is the Laboratory Employee Training and Awareness Checklist.
3	The Laboratory Supervisor will provide appropriate training based on the employee's identified training needs.
4	To assure that training needs are continuously addressed, training records will be kept on the lab tester qualification database. The database will remind lab supervisors when training and training refreshers are needed.
5	Supervisors need to reassess the training requirements for an employee if their assigned job activities change significantly or if they change job positions.

Laboratory Employee Training Checklist

The Laboratory Employee Training Checklist is located in the Appendix 13.

Training Methodologies

Most activities at the Materials Lab require at least some environmental safety and health training and orientation. Each worker's particular work situation determines the method and depth of this training, which can range from an orientation (informal talk) about an environmental health and safety issue to multiple required courses. Training also can include comprehensive, advanced-level training tailored to a specific operation or assignment.
The training methodologies used by the Materials Lab are listed below.

Continued on next page

7.1 Environmental Training Program, Continued

Training Methodology	Description
New Employee Orientation	Whenever a new employee is hired, he/she must undergo a New Employee Orientation that covers topics such as the use of the Manual, structure of safety procedures at the Materials Lab, and general laboratory safety rules.
Classroom Courses	Numerous environmental safety and health courses are taught in a traditional classroom setting. These courses may be provided by DOE or other environmental health and safety training organizations. These classes typically involve an instructor using a stand-up lecture format, often with interactive discussions, demonstrations, videotapes and exercises. Most classroom courses require pre-enrollment, but some are offered on a drop-in, first-come, first-served basis.
On-the-Job Training (OJT).	OJT constitutes "hands-on" training for workers who are new to an area or task. These workers may have a thorough technical background or theoretical understanding of an operation, but require additional training to ensure that they understand the specific details of an operation. To avoid errors that can have a significant impact on safety or operations, OJT will be carefully supervised by a knowledgeable and competent individual. OJT should be conducted so that trainees satisfactorily complete all of the required training objectives and maximize learning from this experience.
Retraining	Certain course information must be updated on a regular basis. Retraining may involve retaking the original course, or taking a different abbreviated course specifically developed as a refresher for the original course.
Safety Meetings	Another means of providing worker training is through periodic safety meetings, which can range from 5-minute, on-the-job (for example, tailgate) types, to formal department or division meetings–or anything in between. They may be conducted as one part of a general meeting, but all Materials Lab organizations should have at least one annual department or division safety meeting to review and discuss relevant health and safety topics and issues. These meetings should be appropriately documented with the date, presenters, content and names of attendees.

Continued on next page

7.1 Environmental Training Program, Continued

Safety Meetings

When safety meetings are used to convey safety information, a record must be kept of the meeting to confirm the event. The record should include the date, subject, acceptable positive identification (such as signatures) of attendees, and the presenter's name.

Section Supervisors should solicit ES&H topics from their group. Potential sources include incident reports and occurrence reports.

Training Topics and Frequency of Training

The training topics, training methodologies, and frequency of training are listed on the Laboratory Employee Training Checklist located in the Appendix 13.

Training Record Keeping

The Laboratory Supervisors using the tester qualification database will maintain training records that demonstrate compliance with the requirements of this training program. The Laboratory Administrative Officer will periodically check to ensure compliance with the training program.

Chapter 8 Control of Documents and Records

8.1 Overview

Introduction

An essential component of the EMS implementation is to maintain information in such a way that would allow someone with a legitimate interest in the EMS to understand how it is designed and implemented. This information is essential for employees who need to know about an EMS issue, as well as for external parties such as customers and regulators. Due to the wide variety of documents used in the EMS, it is essential that a formal approach be developed to control and organize them. The following sections present the procedures for the control of EMS documents and records.

Contents

This section contains the following topics:

Topic	See Page
8.2 Control of Documents	8-2
8.3 Control of Records	8-3

8.1 Control of Documents, Continued

Background

Environmental documents are living guides, such as this Manual, that are continually being updated. Maintaining environmental documents is one of the seven core elements of the EMS.

Purpose

The purpose of this procedure is to ensure that only the current, authorized version of this manual is in use by Materials Lab personnel when executing their activities.

Procedure

The following procedures are implemented at the Materials Lab.

Step	Action
1	The current, implemented version of this manual will be posted on the Materials Lab's Internal Website.
2	Hard copies of relevant sections of the manual will be posted throughout the lab as appropriate. The hard copies will be dated to aid in ensuring the correct version is used.
3	When a document is updated and implemented, employees shall be notified that a new document has been issued. Hard copies of the obsolete documents that have been posted will be removed and replaced with the current version.
4	An electronic or paper copy of outdated documents shall be filed in the custody of the EMS Coordinator for five years or as otherwise required by law.

Records

Records generated by this procedure include:

- An electronic or paper copy of each outdated document.
- Communications to staff notifying them of new implemented versions of EMS documents.

8.2 Control of Records

Background

Environmental records are static and provide evidence of actions taken (e.g., manifests, training records). Maintaining environmental documents and records is one of the 7 core elements of the Environmental Management System. It allows WSDOT to evaluate the operation of the EMS.

Purpose

The purpose of this procedure is to specify requirements for retaining and maintaining environmental records.

Procedure

Maintain required environmental records.

Types of Environmental Records

The environmental records maintained at the Materials Lab include the following:

Environmental Records	Responsible Party	Record Retention	Record Resides
Hazardous Material & Waste Storage Areas Inspection Records	Lab Administrative Officer	3 years	Lab Administrative Office
Satellite Storage Areas Inspection Records	Laboratory Supervisors	3 years	Individual Section Offices
Safety Equipment Inspection Records	Laboratory Supervisors	5 years	Individual Section Offices
Incident Report	Section Supervisors and Laboratory Administrative Officer	5 Years	Lab Administrative Offices
Accident Report	Safety and Health Services Office	30 Years	Safety & Health Services Office
Employee Exposure and Medical Records	Safety and Health Services Office	Duration of employment plus 30 years	Safety & Health Services Office
Ecology Compliance Inspection Reports	Chemical Hygiene Officer and Laboratory Administrative Officer	10 Years	Lab Administrative Office
Dangerous Waste Annual Report	Laboratory Administrative Officer	5 Years	Lab Administrative Office

Continued On Next Page

8.2 Control of Records, Continued

Environmental Records	Responsible Party	Record Retention	Record Resides
Uniform Hazardous Waste Manifest	Laboratory Administrative Officer	5 Years	Lab Administrative Office
Chemical Inventory	Chemical Hygiene Officer and Section Supervisors	5 Years	Chemistry Lab
PPE Hazard Assessment Certification Form	Section Supervisor and Laboratory Administrative Officer	Duration of employment	WSDOT Tester Qualification Database and ATMS
External Communication	Laboratory Administrative Officer	5 Years	Lab Administrative Office
Corrective Action and Recommendations	Laboratory Administrative Officer	5 Years	Lab Administrative Office
Laboratory Employee Training Records	Section Supervisor	Duration of employment	WSDOT Tester Qualification Database and ATMS

Appendices

Appendices Contents

Appendix	Title	Format
1	Incoming Chemical Data Sheet	Word document
2	Chemical Inventory Database	Excel file
3	Chemical Segregation and Incompatibility Chart	Word document
4	Hazard Categories and Safety Considerations • Flammables • Oxidizers • Corrosives • Reactives • Toxins • Compressed Gas • Carcinogens or Suspected Carcinogens	Word document
5	Chemical Handling Sheets • Hydrofluoric Acid • Perchloric Acid	Word document
6	Waste Handling Sheets • Acid Waste Solution • Excel Clean HD Waste • Outdated Chemicals • Partially Filled Chemical Product Containers • Solvent Waste	Word document
7	Emergency Response • Emergency Action Plan • Chemical Spill Report • Incident Report Form • Evacuation Plan	Word document
8	PPE Hazard Assessment Certification Form	Word document
9	Example of MSDS	Word document
10	Accident Report Form (WSDOT Form 750-010)	WSDOT to insert.
11	Inspection Forms: • Hazardous Material/Dangerous Waste Storage Area/Unit Inspection Form • Satellite Hazardous Material and Waste Storage Area Inspection Form • Laboratory Safety Equipment Checklist • Annual Laboratory Safety Inspection Checklist	Word document
12	Chemical Disposition Sheet	Word document
13	Laboratory Employee Training Checklist	Excel file

Appendix 1

Incoming Chemical Data Sheet

Purpose

This form is to be used for inventory tracking purposes. The form should be completed as soon as the chemical is received. The form is to be provided to the Section Supervisors, who will then enter the information into the Materials Laboratory's Chemical Inventory Database.

Responsibility

Section Supervisors

Form

The following information should be recorded:

Item	To Complete
Chemical Name	
Common Name	
CAS Number	
Manufacturer	
Catalog Number	
Hazard Class	
NFPA Code	
Date Received	
Expiration Date	
Storage Location (Lab, Room, Cabinet)	
Container Type	
Container Size	
Number of Containers	
MSDS	Yes/No Date:
Name and Contact information of person completing the form	

Appendix 2

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 1 **Shelf # 1**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Acetic Acid & Iodine Monochloride	Liquid				4	Pint	3=full, 1=3/4
Acid Benzoic	Powder				1	1/4 lb.	3/4
Acid Phthalic	Powder				1	1/4 lb.	2/3
Acid Pyrogallic	Crystal				2	1/4 lb.	1=3/4, 1=1/2
Acid Tannic	Crystal				1	500 g	3/4
Aniline	Liquid	122	201	230	1	Pint	4/5
Ascorbic Acid-Food Grade	Powder	999			2	500 g	1=full, 1=2/3
Dextrin	Powder	999			1	100 g	3/4
Dimethyl Glyoxime	Powder	231			1	oz.	1/2
Diphenylamine, Purified	Crystal	231	232		1	1/4 lb.	2/3
Disodium Ethylenedinitrilotetraacetate	Powder				2	lb.	1=1/3, 1=1/5
Elon	Powder				2	oz.	2=4/5 ea.

Cabinet # 1 **Shelf # 2**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Hydrogen Peroxide, 30%	Liquid	14x	220		2	500 mL.	2=1/4 ea.
Hydroxylamine Hydrochloride	Crystal	232	231		1	lb.	2/3
L-Tartaric Acid	Crystal				2	500 g	1=1/2, 1=3/4
Magnesium Chloride Reagent	Liquid	232			1	Liter	3/4
Monochloroacetic Acid	Crystal	201			1	lb.	3/4
N-1 Naphthylethylene-diamine Dihydrochloride	Powder	231	232		4	25 g	4=1/3 ea.
Piperidine	Liquid	121	231	232	1	Liter	1/4
Picric Acid 1.2% w/v	Liquid				1	Liter	full
Potassium Biiodate 0.0250 N	Liquid				2	Liter	2=full
Potassium Chloride	Liquid	232			5	16 oz.	4=full, 1=2/3
P-tert-Butylphenol	Crystal				1	100 g	3/4
P-Toluenesulfonic Acid Monohydrate	Crystal	231			1	500 g	1/3
Pyridine	Liquid	121	231	232	1	pt.	1/10

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 1 **Shelf # 3**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Quinoline	Liquid	231	232	122	5	250 mL.	4-full, 1=1/10
Salicylic Acid	Powder	231			2	500 g	1=1/4, 1=1/3
Silica Gel	Crystal	999			3	500 g	3=full
Silica Powder 140 mesh, (Filter Aid)	Powder	231			1	lb.	1/3
Sodium Oleate, Purified	Powder				2	lb.	1=1/3, 1=1/2
Sulfanilic Acid	Crystal	232			1	1/4 lb.	1/2
Titanium Dioxide	Powder	231			1	500 g	3/4
Triethanolamine	Liquid	231			1	pt.	3/4

Cabinet # 1 **Shelf # 4**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Alumina Dry Powder	Powder	231			1	500 g	1/2
Activated Alumina Regular 8-16 Mesh	Powder				1	5 lb.	1/4
Ammonium Chloride	Granular	232			1	5 lb.	1/4
Ammonium Persulfate	Crystal	143	232		1	5 lb.	9/10
Boric Acid	Granular				1	2.5 kg.	2/3
Calcium Carbonate	Powder	232			1	5 lb.	1/2
Calcium Oxide	Powder				1	2.5 kg.	3/4
Carbon, Acid Washed 60 Mesh	Powder				1	500 g	1/2
Charcoal 6-16 Mesh	Granular				1	500 g	1/2
Charcoal 8-12 Mesh	Granular				1	500 g	1/10
Citric Acid, Anhydrous	Powder	232			1	500 g	1/4
Cupric Sulfate, 5-Hydrate	Crystal	201	231	232	3	2.5 kg.	2=1/3, 1=1/4

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 1 **Shelf # 5**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Ferrous Sulfate, 7-Hydrate	Crystal	231	232		1	2.5 kg..	1/4
Ferrous Sulfate, 7-Hydrate	Crystal	231	232		1	500 g	2/3
Magnesium Oxide	Powder				1	500 g	1/4
Potassium Chloride	Crystal	232			1	5 lb.	1/3
Potassium Hydroxide	Crystal	220	201		1	5 lb.	1/3
Potassium Sulfate	Powder	231			1	5 lb.	2/3
Sodium Chloride	Crystal	999			1	kg.	full
Sodium Chloride	Crystal	999			1	2.5 kg.	1/4
Sodium Hydroxide	Pellets	220	231	182	1	2.5 kg.	1/10
Sodium Hypochlorite	Pellets				1	2.5 kg.	full

Cabinet # 1 **Shelf # 6**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Kaolin	Powder	231	232		1	5 lb.	1/2
Sodium Acetate	Crystal	232			1	5 lb.	1/6
Sodium Thiosulfate, 5-Hydrate	Crystal	231	232		1	2.5 kg.	1/6
Talc	Powder				1	2 kg.	1/3
Zinc	Mossy				1	5 lb.	1/10
Zinc Chloride	Granular				1	5 lb.	1/5

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 2 **Shelf # 1**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Acetic Anyhydride	Liquid	220	122	182	1	pt.	full
Alcohol Absolute	Liquid				1	500 mL.	full
Alcohol, Anhydrous	Liquid				1	500 mL.	1/4
iso-Amyl Alcohol	Liquid	231	232		1	pt.	full
iso-Propyl Alcohol, 70% v/v	Liquid				1	Liter	1/3
1-Butanol	Liquid	121	231	232	2	500 mL.	1=3/4, 1=full
Butyl Methacrylate Monomer	Liquid	233			1	500 mL.	full
4-Chlorotoluene, 98%	Liquid				1	100 g	2/3
o-Dichlorobenzene	Liquid				2	500 mL.	3/4 ea.
o-Dichlorobenzene	Liquid				1	Liter	1/2
Dimethylformamide	Liquid				1	500 mL.	3/4
Petroleum Ether	Liquid				1	qt.	3/4

Cabinet # 2 **Shelf # 2**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Alcohol, Anhydrous	Liquid				2	4 L	1=3/4, 1=1/3
Acetone	Liquid	121	231		1	4 L	full
Benzene	Liquid	121	230	231	2	8 pt.	1=1/2, 1=full
Carbon Disulfide	Liquid				1	2.5 L	full
Carbon Tetrachloride	Liquid	230	231		2	8 pt.	1=1/3, 1=full
Carbon Tetrachloride	Liquid	230	231		1	pt.	3/4
Carbon Tetrachloride	Liquid	230	231		2	2 pt.	2=full
Cyclohexane	Liquid				1	4 L	3/4
Chloroform	Liquid	230	231		1	4 L	3/4

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 2 **Shelf # 3**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Ether, Anhydrous	Liquid	231	232	120	1	L.	1/4
Ether, Absolute	Liquid				1	4 L.	1/4
Ethyl Alcohol	Liquid	231	232	120	1	4 L.	1/3
Ethylene Dichloride	Liquid				1	gal.	2/3
Ethylene Glycol	Liquid				1	4 L.	2/3
Formaldehyde, 37% Solution	Liquid	230	231	122	1	4 L.	1/3
Heptane	Liquid	231	232	121	1	2 kg.	2/3
Heptane	Liquid	231	232	121	1	500 g	1/2
Hexanes (95% n-hexane)	Liquid	231	121		2	4 L.	2=full
Hexanes	Liquid	231	121		1	4 L.	3/4

Cabinet # 2 **Shelf # 4**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Methyl Ethyl Ketone	Liquid	231	121	232	2	4 L.	1=1/6, 1=full
Methyl iso-Butyl Ketone	Liquid				1	2 pt.	3/4
Nitrobenzene, Purified	Liquid				4	pt.	3=full, 1=1/5
Pentane	Liquid				2	4 L.	1=full, 1=3/4
Tetrahydrofuran	Liquid				2	L.	1=1/6, 1=3/4
Toluene	Liquid				2	4 L.	1=full, 1=2/3
1, 1, 1-Trichloroethane	Liquid				1	4 L.	full
2, 2, 4-Trimethyl-Pentane	Liquid				2	1.1 lb.	1-3/4, 1=1/3

Cabinet # 2 **Shelf # 5**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Xylene	Liquid	121	231		2	pt.	1=1/10, 1=3/4
Xylenes	Liquid	121	231		1	L.	1/10
Xylenes	Liquid	121	231		1	4 L.	3/4

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CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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MISCELLANEOUS CHEMICALS

Cabinet # 3 **Shelf # 1**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Aluminum Hydroxide	Powder	232			1	lb.	3/4
Aluminum Oxide	Powder				1	lb.	Full
Aluminum Potassium Sulfate	Crystal	232			1	lb.	1/10
Aluminum	Powder	231			3	lb.	3 full
Aluminum Sulfate, Dried	Powder	232			1	lb.	3/4
Aluminum Wire	Wire				1	lb.	Full
Ammonium Acetate	Crystal	232			4	lb.	4 Full
Ammonium Carbonate	Crystal				1	500 g	1/2
Ammonium Molybdate 4-Hydrate	Crystal	232	201		1	lb.	1/2
Ammonium Phosphate Dibasic	Crystal	232			1	lb.	1/10
Ammonium Phosphate Dihydrogen	Crystal	232			3	lb.	2 Full, 1=1/10
Ammonium Sulphate	Crystal	232			1	lb.	3/4
Ammonium Thiocyanate	Crystal	232			1	lb.	3/4

Cabinet # 3 **Shelf # 2**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Anhydrone					2	lb.	1=1/10, 1=1/4
Antimony Trichloride	Crystal	220			3	500 g	2 Full, 1 Empty
Antimony Trioxide, Powder	Powder	230	231	232	2	500 g	2 Full
Antimony Metal	Metal	231	232		1	1/4 lb.	3/4
Barium Chloride, Dihydrate	Crystal				1	500 g	Full
Barium Chloride		232	201	231	1	lb.	1/3
Barium Chloride Anhydrous, Powder	Powder				1	lb.	2/3
Barium Hydroxide	Crystal	220			1	500 g	2/3
Cadmium Chloride	Crystal				1	lb.	2/3
Cadmium, Metal Sticks	Sticks	230	231	201	1	oz.	Full
Calcium Acetate, Powder	Powder	232			1	lb.	2/3
Calcium Chloride, -20 Mesh	Crystal	232			3	500 g	1=1/3, 1=2/3, 1=1/2
Calcium Hydroxide, Powder	Powder	232			3	500 g	1=1/3, 2=1/2
Calcium Hypochlorite, Powder	Powder	142	232	201	2	lb.	Full

Calcium Sulfate, Powder	Powder	232			1	500 g	2/3

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 3 **Shelf # 3**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Chromium Metal	Powder	230	231	232	1	lb.	3/4
Cupric Oxide, Black	Powder				1	lb.	3/4
Cupric Oxide	Powder	231	232		1	lb.	1/2
Cupric Sulfate, Anhydrous	Powder	201	231	232	1	lb.	1/3
Cuprous Chloride	Powder	201	231	232	1	1/4 lb.	2/3
Diphenyl Carbazide, Indicator	Powder				1	1/4 lb.	1/2
Ferric Ammonium Sulfate, Coarse	Crystal	231			1	lb.	1/2
Ferric Ammonium Sulfate, Fine	Crystal	231			1	lb.	1/3
Ferric Chloride 6-Hydrate	Lump	231			1	500 g	1/3
Ferrous Sulphide	Sticks				1	lb.	2/3
Hydroxylamine Hydrochloride	Crystal	232	231		1	lb.	1/2
Hydrazine Sulfate	Crystal				1	lb.	3/4
Hydrazine Sulfate	Crystal				1	1/4 lb.	3/4
Iodine	Crystal	231	232		1	1/4 lb.	1/3
Iron, Reduced, F.C.C. (Food Grade)					1	lb.	1/2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 3 **Shelf # 4**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Lanthanum Oxide	Powder	231			2	250 g	2=1/2
Lead Acetate, Crystal	Crystal	231			1	1/4 lb.	2/3
Lead Chloride	Powder	231			1	lb.	Full
Lead Oxide, Litharge	Powder				2	lb.	2=3/4
Lead Oxide, Red Lead	Powder	231			1	lb.	3/4
Dutch Boy, Litharge	Powder				1	qt.	1/4

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Lithium Carbonate	Powder	231			1	lb.	1/2
Lithium Meta-Borate	Powder				1	100 g	1/2
Magnesium Acetate, Crystal	Crystal	999			1	lb.	3/4
Magnesium Chloride, Crystal	Crystal	232			1	lb.	1/2
Magnesium Oxide	Powder				1	lb.	1/2
Magnesium, Powder -50 Mesh	Powder				1	1/4 lb.	1/3
Magnesium, Powder -50 Mesh	Powder				1	lb.	1/2
Malachite Green Oxalate	Crystal				1	25 g	2/3
Manganese Sulfate, Fine Crystals	Crystal				1	lb.	1/4
Manganous Sulfate Monohydrate	Powder				2	lb.	1=1/4, 1=2/3
Mercuric Chloride	Crystal	231	200		1	500 g	empty
Mercuric Chloride	Crystal	231	200		1	kg.	Full
Merczorb	Powder				2	250 g	Full
Molybdenum Trioxide	Powder	231	201		1	lb.	3/4
Molybdic Acid	Powder	231	201		2	kg.	1=full, 1=1/2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 3 **Shelf # 5**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Oxalic Acid, Dihydrate	Crystal	231	220	201	1	500 g	1/3
Potassium Bromide	Crystal				1	100 g	1/2
Potassium Biphthalate	Crystal				1	lb.	3/4
Potassium Bisulphate	Crystal				1	lb.	3/4
Potassium Bisulphate	Powder				1	kg.	1/2
Potassium Bromate	Crystal				1	500 g	Full
Potassium Bromide	Powder				1	25 g	1/4
Potassium Bromide	Crystal				1	lb.	1/2
Potassium Carbonate	Crystal				1	500 g	2/3
Potassium Chloride	Crystal	232			1	500 g	3/4
Potassium Chlorplatinate	Powder				1	10 g	1/4
Potassium Dichromate	Crystal	230	231	232	1	500 g	1/2
Potassium Dichromate	Crystal	230	231	232	1	lb.	1/10
Potassium Ferricyanide	Crystal	231	232		1	lb.	Full

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Potassium Iodine	Granular	231	232	1	p	1/3
Potassium Iodine	Granular	231	232	1	500 g	1/3
Potassium Nitrate	Crystal	231	143	1	500 g	1/3
Potassium Oxalate	Powder			1	250 g	2/3
Potassium Phosphate, Dibasic	Powder			1	lb.	3/4
Potassium Phosphate, Monobasic	Crystal			1	lb.	2/3
Potassium Sulfate	Powder			3	500 g	2=3/4, 1=1/2
Potassium Sulfate	Crystal			1	lb.	1/10
Potassium Sodium Tartrate	Crystal	232		1	lb.	3/4
Silver Acetate	Powder	231	232	1	oz.	2/3
Silver Sulfate	Powder	231	232	0.25	lb.	1/2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 3 **Shelf # 6**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Soda Lime, 4-8 Mesh	Granular	220			1	500 g	1/3
Sodium Acetate, Anhydrous	Powder	232			1	500 g	3/4
Sodium Acetate Trihydrate	Crystal				1	kg.	1/10
Sodium Ammonium Phosphate	Crystal	232			1	lb.	2/3
Sodium Bicarbonate	Powder	232			1	500 g	1/2
Sodium Bismuthate	Powder	231			1	lb.	1/3
Sodium Bisulfate, Fused	Granular	232			3	lb.	3=2/3
Sodium Bisulfite	Granular				1	500 g	1
Sodium Borate	Powder	231			1	lb.	3/4
Sodium Carbonate, Anhydrous	Powder	232			2	500 g	2=1/4
Sodium Chromate	Crystal	230	231	232	1	lb.	2/3
Sodium Meta Silicate	Crystal				2	lb.	1=3/4, 1=Full
Sodium Molybdate Dihydrate	Crystal	231	232		1	500 g	1/10
Sodium Oxalate	Powder	231	232		1	lb.	Empty
Sodium Oxalate	Powder	231	232		1	500 g	Full
Sodium Phosphate Dibasic	Powder	232			2	lb.	2=1/2
Sodium Phosphate Monobasic	Crystal	232			3	1000 g	2=2/3, 1=1/2

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CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Sodium Pyrophosphate, 10-Hydrate	Crystal	232		1	lb.	3/4
Sodium Silicate	Liquid			1	32 fl. oz.	1/2
Sodium Sulfate, Anhydrous	Powder	232	231	1	500 g	3/4
Sodium Sulfate, 10-Hydrate	Crystal	232	231	2	500 g	1=1/2, 1=1/10
Starch	Powder	999		2	lb.	1=3/4, 1=1/2
Mercury Vapor Absorbent	Powder			1	2 lb.	1/2

Room # B139

MISCELLANEOUS CHEMICALS

Cabinet # 3 **Shelf # 7**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Sodium Sulfite	Crystal	231			2	lb.	2=1/2
Sodium Sulfite	Powder	231			2	lb.	1=Full, 1=2/3
Sodium Tartrate, Dihydrate	Crystal	231			1	lb.	1/3
Stannous Chloride, Anhydrous	Crystal	231	232		3	500 g	1=1/3, 2=1/2
Titanium Dioxide	Crystal	231			1	lb.	2/3
Tin	Tin	231			1	lb.	1/3
Zinc Acetate	Crystal	231	232		3	lb.	1=Full, 2=3/4
Zinc	Granular	231			1	lb.	1/2
Zinc Oxide	Powder	231			1	lb.	Full

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CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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CHEMICAL STANDARDS

Cabinet # 4 **Shelf # 1**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Arsenious Acid	Powder				1	1/4 lb.	2/3
Benzoic Acid	Powder	232			1	1/4 lb.	3/4
Calcium Carbonate	Powder	232			1	lb.	2/3
Iron Wire 0.009"	Wire	231			1	lb.	Full
Iron Wire	Wire	231			1	1/4 lb.	2/3
Potassium Dichromate	Granular	230	231	232	2	1/4 lb.	1=Full unopened, 1=1/10
Platinum Chloride 5%	Liquid	231	232		2	oz.	2=1/2
Traffic Yellow Pigment	Powder				1	1/4 lb.	1/2
Titanium Dioxide	Powder				1	1/4 lb.	1/2
Calcium Carbonate	Powder				1	1/4 lb.	2/3
Sodium Oxalate, Standard	Powder	231	232		1	1/4 lb.	Full, unopened
Zinc 30 Mesh	Granular				1	lb.	1/3
Zinc Mesh	Granular				1	lb.	Full
Alundum - Plain Granular	Granular				1	250 g	Full
Alundum - Selenized Granular	Granular				1	250 g	Full
Chloroplatinic Acid	Liquid				1	50 g	4/5
Zephiran Chloride Concentrate	Liquid				1	4 fl. oz.	1/2
H_2S Generator	Powder				6	Vials	6 Full

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CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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CHEMICAL STANDARDS

Cabinet # 4 **Shelf # 2**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Barium Diphenylaminesulfonate	Powder				1	5 g	1/10
Barium Diphenylaminesulfonate	Powder				1	5 g	Empty
Barium Diphenylaminesulfonate	Powder				2	5 g	2=1/10
Brom Cresol Green Methyl Red	Liquid	999			1	16 oz.	3/4
Eriochrome Black T Indicator	Powder	232			1	10 g	1/3
Eriochrome Black T Indicator	Powder	232			1	100 g	1/10
Eriochrome Black T Indicator	Powder	232			1	lb.	1/10
Diethyldithiocarbamic Acid Silver Salt	Granular				1	25 g	1/2
Hydroxy-Sulfo-Naphthylazo-Naphthoic Acid	Powder				1	1 g	1/10
2', 7' Dichloroflourescein	Powder				1	5 g	1/3
Flourescein-Disodium Salt	Granular				1	100 g	3/4
Flourescein Water Soluble	Powder				1	lb.	1/4
Bromophenol Blue	Powder				1	5 g	1/4
Bromophenol Blue	Liquid				1	500 mL	1/4
Methyl Orange, Sodium Salt	Granular	231			1	oz.	3/4
Methyl Red	Liquid	231			1	500 mL	3/4
Methyl Red	Crystal	231			1	oz.	1/2
Methyl Red Hydrochloride	Crystal				2	oz.	2=1/2
Methylene Blue	Powder	231			1	10 g	1/2
Phenolphthalin	Powder	231			1	25 g	2/3
Phenolphthalein	Powder	231			1	1/4 lb.	3/4

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CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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CHEMICAL STANDARDS

Cabinet # 4 **Shelf # 3**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Tempil Pellets, 300°F	Pellets				1	Vial	Full
Tempil Pellets, 750°F	Pellets				1	Vial	Full
Tempil Pellets, 1200°F	Pellets				1	Vial	Full
Tempil Pellets, 1650°F	Pellets				1	Vial	Full
Tempil Pellets, 2000°F	Pellets				1	Vial	Full
Potassium Iodide Starch	Test Papers	231	232		25	100 Strips	Full
8.4 pHydrion Buffers	Capsules				1	Vial	1/2
5.8 pHydrion Buffers	Capsules				1	Vial	1/2
4.6 pHydrion Buffers	Capsules				1	Vial	1/2
Aluminon Reagent Indicator	Powder	231			1	1 g	1/4
Sulfur in Residual Fuel Oil	Oil				1	4 oz.	3/4
Calcium Aluminate Cement, Orage Cap	Powder				6	Vials	Full
634 Portland Cement, Gold Cap	Powder	232	231		1	Vials	Full
635 Portland Cement, Blue Cap	Powder	232	231		2	Vials	Full
1886 Portland Cement, Cranberry Cap	Powder	232	231		4	Vials	Full
Sodium Oxalate 40h	Powder	231	232		1	410 mg	1/3
Steel Acid-Open Hearth 0.2%C 19g	Granular				1	100 g.	1/10
Steel Acid-Open Hearth 0.4%C 12h	Granular				1	100 g.	1/3
Steel 18 Chromium 10 Nickel 101f (stainless)	Granular				1	100 g.	1/4
Iron Ore 27e	Powder				1	100 g.	3/4
1013 Portland Cement Standard	Powder	232	231		3	Vials	Full
1016 Portland Cement Standard	Powder	232	231		3	Vials	Full
1180a Portland Cement Standard	Powder	232	231		2	Vials	Full
1881a Portland Cement Standard	Powder	232	231		2	Vials	Full
1885a Portland Cement Standard	Powder	232	231		2	Vials	Full
1887a Portland Cement Standard	Powder	232	231		3	Vials	Full
1888a Portland Cement Standard	Powder	232	231		3	Vials	Full
Copper 45d	Solid				2	Cylinders	1 3/4
Zinc 740a	Granular				1	200 g	3/4
Potassium Hydrogen Phthalate	Crystal				1	100 g.	1/2

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CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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Room # B139

CHEMICAL STANDARDS

Cabinet # 5 **Shelf # 1**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Chromium, 1000 PPM	Liquid				1	500 g	full
Magnesium, 1000 PPM	Liquid				1	500 g	1/2
Manganese Reference Standard	Liquid				1	500 g	2/3
Copper Reference Standard	Liquid				1	500 g	9/10
Molybdenum Reference Standard	Liquid				1	500 g	9/10
Vanadium Reference Standard	Liquid				1	500 g	9/10
Zinc, 1000 PPM	Liquid				1	500 g	9/10
Nickel, 1000 PPM	Liquid				1	500 g	9/10
Arrowroot Starch	Powder				1	Bag	1/2
Tris 1, 10-Phein-Anthroline, Iron Sulfate Solution	Liquid				1	100 mL	3/4

Cabinet # 5 **Shelf # 2**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Chrome Azurol S Indicator	Powder	231			1	25 g	3/4
Clayton Yellow Indicator	Powder	231			1	25 g	1/2
Sodium Tetraphenylboron	Powder				1	10 g	1/2
Meta-Cresol Sulfon Phthalein	Powder	231			1	10 g	1/10
Naphtol Green B	Powder				1	10 g	1/2
P-Naphtolbenzein	Powder				1	25 g	1/2
1-10 Phenanthroline	Powder				1	5 g	2/3
Thymol Phthalein	Powder	231			1	10 g	1/4
Daniel Boone Paints	Liquid				1	Pint	3/4
Alizarin Red S Indicator	Powder	232	233		1	100 g	1/2
Zinc Metal Dust	Dust	133	231		1	500 g	1/8
Cannon Certified Viscosity Standard S200 (KU)	Liquid				1	Pint	3/4
Cannon Certified Viscosity Standard K400 (KU)	Liquid				1	Pint	3/4
Soil Calibration Sample for CHNS	Powder				1	65 g	Full-unopened
Lead Standard, 1000 PPM Pb	Liquid				1	100 mL	1/2

Tech DDT 77.2% PIP Isomer	Powder	1	Vial	1/10
DDT 50% Wettable Isomer	Powder	1	Vial	full

Room # B139

CHEMICAL STANDARDS

Cabinet # 5 **Shelf # 3**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Aluminum Plasma Emission Standard	Liquid				1	100 mL	3/4
Antimony Plasma Emission Standard	Liquid				1	100 mL	3/4
Arsenic Plasma Emission Standard	Liquid				1	50 mL	1/3
Barium Plasma Emission Standard	Liquid				1	50 mL	1/4
Boron, 10,000 ug/mL	Liquid				1	100 mL	3/4
Boron Plasma Emission Standard	Liquid				1	100 mL	3/4
Cadmium Plasma Emission Standard	Liquid				1	100 mL	1/3
Calcium Plasma Emission Standard	Liquid				2	100 mL	1=2/3, 1=1/3
Calcium 10,000 ug/mL (0.10% w/v)	Liquid				1	100 mL	1/2
Chromium 10,000 ug/mL (1.00% w/v)	Liquid				1	100 mL	3/4
Copper 10,000 ug/mL (1.00% w/v)	Liquid				1	100 mL	3/4
Iron Plasma Emission Standard	Liquid				1	100 mL	3/4
Lead Standard, 10,000 ug/mL (0.10% w/v)	Liquid				1	100 mL	3/4
Magnesium 10,000 ug/mL (1.00% w/v)	Liquid				1	100 mL	1/2
Magnesium Plasma Emission Standard	Liquid				1	100 mL	3/4
Manganese 10,000 ug/mL (1.00% w/v)	Liquid				1	100 mL	3/4
Mercury Plasma Emission Standard	Liquid				1	100 mL	3/4
Mercury 10,000 ug/mL (1.00% w/v)	Liquid				1	100 mL	3/4
Molybdenum 10,000 ug/mL (1.00% w/v)	Liquid				1	100 mL	4/5
Nickel 10,000 ug/mL (1.00% w/v)	Liquid				1	100 mL	4/5
Phosphorous Plasma Emission Standard	Liquid				1	100 mL	1/2
Potassium Plasma Emission Standard	Liquid				1	100 mL	3/4
Selenium 10,000 ug/mL	Liquid				1	100 mL	3/4
Silicon Plasma Emission Standard	Liquid				1	100 mL	3/4
Sodium Plasma Emission Standard	Liquid				1	100 mL	3/4
Strontium Plasma Emission Standard	Liquid				2	100 mL	1=3/4, 1=Full
Sulfur Plasma Emission Standard	Liquid				1	100 mL	2/3
Tin Plasma Emission Standard	Liquid				1	100 mL	4/5

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Titanium Plasma Emission Standard	Liquid	1	100 mL	3/4
Vanadium 10,000 ug/mL (1.00% w/v)	Liquid	1	100 mL	4/5
Zinc, 10,000 ug/mL	Liquid	1	100 mL	2/3
QCI-700 Ultra Check Trace Metals Sample	Powder	1 x 10	Package	full
QCI-740 Ultra Check Nutrients Sample	Powder	2 x 10	Package	full

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CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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Room # B139

CHEMICALS

Cabinet # 6 **Shelf # 5**

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Ammonium Chloride	Granular	232			1	500 g	3/4
Ammonium Nitrate	Solid	232			2	500 g	1=3/4, 1=1/2
Ammonium Oxalate Monohydrate	Crystal	232	201		1	500 g	1/10
Ammonium Persulfate	Crystal	143	232		2	500 g	1=3/4, 1=2/3
Calcium Hypochlorite, Purified	Powder	142	232	201	1	lb.	2/3
Ceric Ammonium Nitrate	Crystal	232			1	1/4 lb.	3/4
Lead Nitrate	Crystal	231			1	1/4 lb.	2/3
Mercury Nitrate	Crystal				1	125 g	1/3
Potassium Chromate	Crystal	230	231	232	1	lb.	1/2
Potassium Dichromate	Crystal	230	231	232	1	lb.	Full/unopened
Potassium Ferrocyanide	Crystal	231	232		1	1/4 lb.	1/4
Potassium Periodite Meta	Powder				1	1/4 lb.	3/4
Potassium Permanganate	Crystal	142	231	232	1	500 g	1/2
Silver Nitrate	Crystal	143	232	231	3	500 g	2-1/2, 1=1/10
Sodium Azide OR	Crystal				1	100 g	1/3
Sodium Fluoride	Powder				1	lb.	1/2
Sodium Nitrate	Crystal				2	lb.	1=3/4, 1=1/2
Sodium Nitrate Flux Grade	??				1	500 g	1/2
Sodium Peroxide	Granular	143	220	181	1	500 ml	1/2

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room #B139

Acid Cabinet # 1 — Shelf #1

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Hydrochloric Acid	Liquid				7	2.5 L	6=full, 1=1/3
Hydrochloric Acid	"				3	2.5 L	2=half, 1=1/4
Cleaning Acid (Hydrochloric)	"				1	2.5 L	1/4
Hydrochloric Acid with Antimony Trioxide	"				1	?	1/5

Acid Cabinet # 2 — Shelf #1

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Sulfuric Acid	Liquid				2	Qt.	1=3/4, 1=1/2
Hydrochloric Acid	"				7	Qt.	full
Hydrochloric Acid	"				1	Pt.	full
Siloxane Catalyst-Acid	"				1	Qt.	"
Hydrofluoric Acid	"				2	500 mL	1=3/4, 1=1/5
Perchloric Acid	"				6	500 mL	full

Acid Cabinet # 2 — Shelf #2

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Salicylic Acid in Sulfuric Acid	Liquid				1	2.5 L	3/4
Sulfuric Acid	"				3	"	2=3/4, 1=1/3
Chromic Sulfuric Acid	"				4	"	3=full, 1=1/3
Sulfuric Acid (Drain Opener)	"				5	Qt.	full
Fuming Sulfuric Acid	"				2	2.5 L	full
Sulfurous Acid	"				2	1=5 lbs, 1=500 mL	3/4 each

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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Room #B139

Base Cabinet — Shelf #1

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Sodium Hydroxide	Liquid				1	500 mL	1/4
Sodium Hydroxide	"				1	3.78 L	full
Ammonium Hydroxide	"				7	2.5 L	full
Potassium Hydroxide	"				1	500 mL	3/4

Acid Cabinet #3 — Shelf #1

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Nitric Acid	Liquid				3	250 mL	2=full, 1=1/3
Phosphoric Acid	"				3	2.5 L	full
Hypophosphorous Acid	"				1	250 mL	3/4
Strong Acetate Solution	"				2	500 mL	1=3/4, 1=1/4
Phosphorous Acid	"				1	250 mL	1/2

Acid Cabinet #3 — Shelf #2

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Acetic Acid	Liquid				3	2.5 L	full
Nitric Acid	"				6	2.5 L	full
Nitric Acid (Used Waste)	"				4	2.5 L	full

Muffle Furnace Hood

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Bromine	Liquid				2	200 ml	2

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room #B136

Paint Testing Area

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Ether	Liquid				1	4L	1.5
Petroleum Ether	"				1	4L	1
Petroleum Naptha (SkellySolve)	"				1	Gal	1
Thinner (Sherwin Williams)	"				1	Gal	1
Thinner (Wasser)					1	Gal	1

Refrigerator

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Paranitrobenzenediazonium - tetrafluoroborate	Solid				1	200 g	2-Jan
Dansyl Chloride	"					Lb	0.02

Large Paint Hood - (beneath)

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Hot Quenching Oil (MarTemp 2525)	Liquid				3	10 Gal	3

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
Building Area 2

Room #B125

Instrument Lab - Compressed Gases

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Helium	Gas				1	Cylinder	1
Oxygen	"				1	Cylinder	1
Compressed Air	"				1	Cylinder	1
Argon	"				1	Cylinder	1

Instrument Lab - Leco Carbon/Sulfur Analyzer Supplies

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Iron Accelerator	Solid				5	200 g	7
Copper Accelerator	"				6	200g	7
Tin Accelerator	"				3	200 g	3
Magnesium Perchlorate (Anhydrone)	"				2	500 g	2
Platinum Silica Catalyst	"				1	100 g	1
LecoSorb (Ascarite II)	"				2	500 g	2
LecoCell	"				1	500 g	1
Magnesium Oxide	"				1	500 g	1

Instrument Lab - Desicator

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Potassium Bromide	Solid				1	100 g	1

Appendix 2A
CHEMISTRY LAB CHEMICAL INVENTORY as of DECEMBER 2004
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Instrument Lab - In Hood

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Chloroform	Liquid				1	500 ml	1
Ethyl Alcohol	"				1	500 ml	1
Methanol	"				1	500 ml	1
Dimethylformamide	"				1	500 ml	1

Instrument Lab - Under Hood

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Hyvac Oil	Liquid				1	Gal	1

Instrument Lab - Under Sink

CHEMICAL NAME		HAZ CLASS	HAZ CLASS	HAZ CLASS	QUANTITY ON HAND	UNITS	FULL
Bleach	Liquid				1	Gal	38354

Appendix 2B
Asphalt
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

Section/Room	COMMON NAME	CHEMICAL NAME / DESCRIPTION		QUANTITY ON HAND	UNITS
ASPHALT LAB	EXCEL	EXCEL	CITRUS CLEANER	5	GALLONS
ASPHALT LAB	ACETONE	ACETONE	ACETONE	5	GALLONS
ASPHALT LAB	XYLENES	XYLENES	XYLENES	1	LITER
ASPHALT LAB	TRICHLORETHYLENE	TRICHLORETHYLENE	TRICHLORETHYLENE	2	LITERS
ASPHALT LAB	TOLUENE	TOLUENE	TOLUENE	2	LITERS
ASPHALT LAB	CUTBACK ASPHALT	CUTBACK ASPHALT	MC-250	33.7	LBS
ASPHALT LAB	EMULSIFIED ASPHALT	EMULSIFIED ASPHALT	VARIOUS EMULSIFIED ASPHALTS	83.2	LBS
ASPHALT LAB	GLYCERIN	GLYCERIN	GLYCERIN	1/3	LITER
ASPHALT LAB	SILICONE FLUID	SILICONE FLUID	SILICONE FLUID	1	GALLON
ASPHALT LAB	ETHYLENE GLYCOL	ETHYLENE GLYCOL	ETHYLENE GLYCOL	2	LITERS
ASPHALT LAB	TERGITAL NP-4 SURFACTANT	TERGITAL NP-4 SURFACTANT	DUCTILITY MOLD RELEASE	1	LITER
ASPHALT LAB	ETHYLHEXYL SODIUM	ETHYLHEXYL SODIUM	ETHYLHEXYL SODIUM	75	ml
ASPHALT LAB	RELEASE AGENT	REALESE AGENT	REALESE AGENT	1/4	LITER
ASPHALT LAB	PH7, GREEN BUFFER	PH7, GREEN BUFFER	PH7, GREEN BUFFER	2	LITERS
ASPHALT LAB	TALC	TALC	TALC	96	OZ
ASPHALT LAB	PH4, RED BUFFER	PH4, RED BUFFER	PH4, RED BUFFER	2	LITERS
ASPHALT LAB	SAYBOLT BATH OIL	SAYBOLT BATH OIL	SAYBOLT BATH OIL	3	GALLONS
ASPHALT LAB	VACUUM PUMP OIL	VACUUM PUMP OIL	VACUUM PUMP OIL	2/3	LITER
ASPHALT LAB	SODIUM PHOSPHATE	SODIUM PHOSPHATE	SODIUM PHOSPHATE	3.5	KG
ASPHALT LAB	INDUSTRIAL GREASE	INDUSTRIAL GREASE	INDUSTRIAL GREASE	28	OZ
ASPHALT LAB	TEL-X-PLUS	TEL-X-PLUS	DRY LUBRICANT RELEASE AGENT	16	OZ

Appendix 2B
Bit Mix
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

SECTION	ROOM #	NAME & DESCRIPTION	QUANTITY HAND	QUANTITY STORE	UNITS
ASPHALT/BITMIX	B146	ACETONE	5	55	GALLON
ASPHALT/BITMIX	B146	ANDEROL 465 LUBRICATION OIL	3		3 oz
ASPHALT/BITMIX	B146	ANTI-STRIP AGRIGRIP		1	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP ALBINA		1	PINT
ASPHALT/BITMIX	B146	ANTI-STRIP ARRMAZ 6500	1	4.5	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP KING BETA 2912	1		QUART
ASPHALT/BITMIX	B146	ANTI-STRIP KOCH POLAR BOND	1	4	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP MISC RAW MAT		1	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP MORELIFE 3300	1	11	PINT
ASPHALT/BITMIX	B146	ANTI-STRIP MORELIFE 5000		1	PINT
ASPHALT/BITMIX	B146	ANTI-STRIP REDICOTE 95 S		1	PINT
ASPHALT/BITMIX	B146	ANTI-STRIP REDICOTE C-2914	1		QUART
ASPHALT/BITMIX	B146	ANTI-STRIP SOUND REFINING		1	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP UNICHEM 8162	1	5.5	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP UP 5000		2	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP US OIL AD-HERE 10F 6500	1	1/4	QUART
ASPHALT/BITMIX	B146	ANTI-STRIP US OIL AD-HERE 7700		1/2	PINT
ASPHALT/BITMIX	B146	ANTI-STRIP US OIL AD-HERE R-212		1	QUART
ASPHALT/BITMIX	B146	BIG ORANGE CITRUSE DEGREASER	2.5		24 oz
ASPHALT/BITMIX	B146	CHEMSEARCH DEPLOY LUBRICANT	1		10.5 oz
ASPHALT/BITMIX	B146	CHEMSEARCH LEXITE NF CLEANER DEGREASER	1		15 oz
ASPHALT/BITMIX	B146	CHEMSEARCH NATURALIZER ORANGE OIL DEGREASER	1		12 oz
ASPHALT/BITMIX	B146	CHEMSEARCH SILA-CHEM SILICONE	12		9 oz
ASPHALT/BITMIX	B146	CHEMSEARCH VOLTZ SOLVENT AEROSOL	2		11 oz
ASPHALT/BITMIX	B146	CHEMSEARCH YIELD LOOSENS RUST AWAY	3		12 oz
ASPHALT/BITMIX	B146	CHEVRON DURA-LITH GREASE EP NLGI 2	1		12 oz
ASPHALT/BITMIX	B146	CHEVRON HYDROLIC OIL 32	5		GALLON
ASPHALT/BITMIX	B146	CHEVRON INDUSTRIAL GREASE MEDIUM	21		14 oz
ASPHALT/BITMIX	B146	CHEVRON ISO 150 OIL	4		GALLON
ASPHALT/BITMIX	B146	CRC MINUTE MEND EPOXY PUTTY	1		4 oz
ASPHALT/BITMIX	B146	D-SCENT 0119	1		GALLON
ASPHALT/BITMIX	B146	ELMER'S GLUE ALL	1		QUART
ASPHALT/BITMIX	B146	EXCEL	12	75	GALLON
ASPHALT/BITMIX	B146	LITE DRI ABSORBENT	22		LBS
ASPHALT/BITMIX	B146	LYSOL LIQUID CLEANER	1		25 oz

Appendix 2B
Bit Mix
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

SECTION	ROOM #	NAME & DESCRIPTION	QUANTITY HAND	QUANTITY STORE	UNITS
ASPHALT/BITMIX	B146	MAGNALUBE-G MACHINE GREASE	7		LBS
ASPHALT/BITMIX	B146	MVP HAND CLEANER	1/2		10 oz
ASPHALT/BITMIX	B146	OIL BINDERS (ASPHALT)	17	350	QUART
ASPHALT/BITMIX	B146	PRO-KLEEN FLOOR CLEANER	3/4		GALLON
ASPHALT/BITMIX	B146	RED GASKET MAKER	1		7.5 oz
ASPHALT/BITMIX	B146	ROTO-ROOTER PIPE CLEANER	1		GALLON
ASPHALT/BITMIX	B146	SHELL SPINDLE OIL 10 (STABILITY OIL)	5		GALLON
ASPHALT/BITMIX	B146	SPIC AND SPAN SCRUBBING DETERGENT	2		LBS
ASPHALT/BITMIX	B146	SPILL SHARK (WATER-BASED SPILL ABSORBENT)	7		LBS
ASPHALT/BITMIX	B146	SPILL-X-S SOLVENT ABSORBENT	10		LBS
ASPHALT/BITMIX	B146	TELLUS ISO-VG LUBRIFICATION OIL	1		2 oz
ASPHALT/BITMIX	B146	TKO HAND CLEANER	1/2		GALLON
ASPHALT/BITMIX	B146	TRICHLOROETHYLENE	9.2	36	LITRES
ASPHALT/BITMIX	B146	WHITE SPRAY PAINT	1		17 oz

Appendix 2B
Phs Test
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

Section	Room	Name	Description	Quantity	Units
Phy Test	B142	Grease	Chevron Industrial Grease, Medium	253	OZ
Phy Test	B142	Voltz II	De-greaser solution	1	Gal
Phy Test	B142	Lubricant	Dow Molykote GN Paste lubricate	10	Gal
Phy Test	B147	Micro-crystalling wax (Parafin)	Mobil 2305 WAT	3	Lbs
Phy Test	B149	Sulfur (S) Silica (S102)	Cylinder Capping Compound	60	Lbs
Phy Test	B149	01564 Almag Oil	Metal Working Fluid	170	Lbs
Phy Test	B153	Lignin Solution	Daratard 17	3	Lbs
Phy Test	B153	Fly Ash-Centralia	Fly Ash-Centralia	30	Lbs
Phy Test	B153	Air Entrainment Additive	Protex Industries	5	Lbs
Phy Test	B153	Latex Concrete Additive	Modifier A	20	Lbs
Phy Test	B153	Water Reducer WRDA-79	Water Reducer WRDA-79	20	Lbs
Phy Test	B151	Sodium Hexameta Phosphate	Sodium Hexameta Phosphate	31	Lbs
Phy Test	B151	Stock Solution	Stock Solution	31	Gal
Phy Test	C157	Pump Oil	Chevron AW Hydraulic Oil 150	5	Gal
Phy Test	B147		Potassium Hydoxide Pellets	9	Lbs
Phy Test	B147		Petroleum Ether	1.2	Gal
Phy Test	B147		Ottawa Sand	360	Lbs
Phy Test	B147	Ideal Type II	Cement	1000	Lbs
Phy Test	B153		Reducer WRDA-19	20	Lbs
Phy Test	C151	Deox	Hydrochloric Acid	16	Lbs
Phy Test	B147	White Pigmented Curing Compound 1300(Wax)	Type 1	5	Qt
Phy Test	B147	White Pigmented Curing Compound 1600(Wax)	Type 2	5	Qt
Phy Test	B147	All Resin Curing Compound WT 1200 (H20)	Type 1	5	Qt
Phy Test	B147	All Resin Curing Compound WT 1200 (H20)	Type 2	5	Qt
Phy Test	B147	Chlo. Rubber Curing Compound	Type 1	5	Qt
Phy Test	B147	Chlo. Rubber Curing Compound	Type 2	5	Qt
Phy Test	B147	Vinsol Nux	Hercules Inc	0.25	Lbs
Phy Test	B142	Socketfast	Resin	1	Gal
Phy Test	B147	Burke Form Release #1	Burke Form Release #1	0.25	Gal
			Latex 460 NA	7	Lbs

Appendix 2B
B160, B161
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

ROOM	COMMON NAME	CHEMICAL NAME / DESCRIPTION		QUANTITY ON HAND	UNITS
BACK HALL SHELVES	PG BINDER	PG BINDER	PG BINDER-VARIOUS GRADES	500	LBS
BACK HALL SHELVES	EMULSIFIED ASPHALT	EMULSIFIED ASPHALT	VARIOUS EMULSIFIED ASPHALTS	84	LBS
Hazardous Materials Unit B161	EXCEL	EXCEL	CITRUS CLEANER	90	GALLONS
Hazardous Materials Unit B161	ACETONE	ACETONE	ACETONE	60	GALLONS
Hazardous Materials Unit B161	ALCOHOL, REAGENT	ALCOHOL, REAGENT	ALCOHOL, REAGENT	64	LITERS
Hazardous Materials Unit B161	XYLENES	XYLENES	XYLENES	12	LITERS
Hazardous Materials Unit B161	TRICHLORETHYLENE	TRICHLORETHYLENE	TRICHLORETHYLENE	44	LITERS
Hazardous Materials Unit B161	TOLUENE	TOLUENE	TOLUENE	48	LITERS
EAST END SHED	ASPHALT BINDER	ASPHALT BINDER	BINDER-VARIOUS GRADES	1000	LBS
SIDE HALL SHELVES	PG BINDER	PG BINDER	PG BINDER-VARIOUS GRADES	2500	LBS
Hazardous waste Unit B160	TRICHLORETHYLENE	TRICHLORETHYLENE	TRICHLORETHYLENE	20	GALLONS
Hazardous waste Unit B160	EXCEL	EXCEL	CITRUS CLEANER	30	GALLONS
Hazardous waste Unit B160	ALCOHOL, REAGENT	ALCOHOL, REAGENT	ALCOHOL, REAGENT	4	LITERS
Hazardous waste Unit B160	EXTRAN 1000	EXTRAN 1000		4	LITERS
	SULFOSUCCIAONATE	SULFOSUCCIAONATE			

Appendix 2B
Shop
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

Section/Room	COMMON NAME	CHEMICAL NAME / DESCRIPTION		QUANTITY ON HAND	UNITS
ASPHALT LAB	EXCEL	EXCEL	CITRUS CLEANER	5	GALLONS
ASPHALT LAB	ACETONE	ACETONE	ACETONE	5	GALLONS
ASPHALT LAB	XYLENES	XYLENES	XYLENES	1	LITER
ASPHALT LAB	TRICHLORETHYLENE	TRICHLORETHYLENE	TRICHLORETHYLENE	2	LITERS
ASPHALT LAB	TOLUENE	TOLUENE	TOLUENE	2	LITERS
ASPHALT LAB	CUTBACK ASPHALT	CUTBACK ASPHALT	MC-250	33.7	LBS
ASPHALT LAB	EMULSIFIED ASPHALT	EMULSIFIED ASPHALT	VARIOUS EMULSIFIED ASPHALTS	83.2	LBS
ASPHALT LAB	GLYCERIN	GLYCERIN	GLYCERIN	1/3	LITER
ASPHALT LAB	SILICONE FLUID	SILICONE FLUID	SILICONE FLUID	1	GALLON
ASPHALT LAB	ETHYLENE GLYCOL	ETHYLENE GLYCOL	ETHYLENE GLYCOL	2	LITERS
ASPHALT LAB	TERGITAL NP-4 SURFACTANT	TERGITAL NP-4 SURFACTANT	DUCTILITY MOLD RELEASE	1	LITER
ASPHALT LAB	ETHYLHEXYL SODIUM	ETHYLHEXYL SODIUM	ETHYLHEXYL SODIUM	75	ml
ASPHALT LAB	RELEASE AGENT	REALESE AGENT	REALESE AGENT	1/4	LITER
ASPHALT LAB	PH7, GREEN BUFFER	PH7, GREEN BUFFER	PH7, GREEN BUFFER	2	LITERS
ASPHALT LAB	TALC	TALC	TALC	96	OZ
ASPHALT LAB	PH4, RED BUFFER	PH4, RED BUFFER	PH4, RED BUFFER	2	LITERS
ASPHALT LAB	SAYBOLT BATH OIL	SAYBOLT BATH OIL	SAYBOLT BATH OIL	3	GALLONS
ASPHALT LAB	VACUUM PUMP OIL	VACUUM PUMP OIL	VACUUM PUMP OIL	2/3	LITER
ASPHALT LAB	SODIUM PHOSPHATE	SODIUM PHOSPHATE	SODIUM PHOSPHATE	3.5	KG
ASPHALT LAB	INDUSTRIAL GREASE	INDUSTRIAL GREASE	INDUSTRIAL GREASE	28	OZ
ASPHALT LAB	TEL-X-PLUS	TEL-X-PLUS	DRY LUBRICANT RELEASE AGENT	16	OZ

Appendix 2B
Geo Soils Electrical
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

Section	Room	Name	Description	Quantity	Units
GeoTech	C170	Hydraulic Fluid	Hydraulic Fluid	0.5	Pint
Soils	C161	Hydraulic Fluid	Hydraulic Fluid	2	Quart
Electrical	B130	AR19	Isopropyl Alcohol	0.82	Gal
Electrical	B130	NC-123	Petrolem Dist	1	Gal

Appendix 2B
Nuke
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

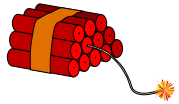
ROOM	COMMON NAME	CHEMICAL NAME / DESCRIPTION		QUANTITY ON HAND	UNITS
NUKE LAB	VOLTZ	VOLTZ	NON CHLORINATED SOLVENT	1584	OZ
NUKE LAB	TEL-X-PLUS	TEL-X-PLUS	LUBRICANT RELEASE AGENT	660	OZ
NUKE LAB	MAXI-LUBE AERSOL	MAXI-LUBE AERSOL	DRY LUBRICANT RELEASE AGENT	176	OZ
NUKE LAB	NC-123	NC-123	MOISTURE DISPLACEMENT-ELECTRICAL	75	OZ
NUKE LAB	CHEM GUARD	CHEM GUARD	CLEAR PLASTIC COATING	163	OZ
NUKE LAB	AR-19	AR-19	CLEANER & MICROSCOPIC PROTECTION	270	OZ
NUKE LAB	YIELD	YIELD	LUBRICANT-MOISTURE DISPLACEMENT	72	OZ
NUKE LAB	ZOFF	ZOFF	NONPOUROUS SURFACE CLEANER	234	OZ
NUKE LAB	CLEAR GUARD	CLEAR GUARD	CLEAR RUBBERIZED COATING	55	OZ
NUKE LAB	THREAD-EZE ULTRA	THREAD-EZE ULTRA	ANTI-SEIZE COMPOUND	115	OZ
NUKE LAB	TRUMP PLUS	TRUMP PLUS	MULTI-PURPOSE GREASE	336	OZ

Appendix 2B
Drill
HAZARDOUS MATERIAL LIST IN MATERIALS LABORATORY

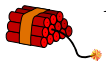
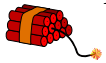
Section	Room	Name	Description	Quantity	Units
Drill	C255	Chemsearch Super Chemsolv	Electrical Motor Cleaner	320	Fl. Oz.
Drill	C255	Chemsearch Yield	Spray Lubricant	252	Fl. Oz.
Drill	C255	Chemsearch Voltz	Non Chlorinated Solvent	319	Fl. Oz.
Drill	C255	Chemsearch Maxi Lube Red	Aluminum Complex Grease	473	Fl. Oz.
Drill	C255	Chemsearch Deploy	Lubricant	63	Fl. Oz.
Drill	C255	Chemsearch Deploy Gel	Gear Gel Lubricant	52.5	Fl. Oz.
Drill	C255	Chemsearch GEX Plus	Open Gear Moly Lubricant	348	Fl. Oz.
Drill	C255	Chemsearch Tel-X	Fluorocarbon Dry Lubricant & Release Agent	224	Fl. Oz.
Drill	C255	Chemsearch Rebound	Areosol Rubberized Coating	272	Fl. Oz.
Drill	C255	Chemsearch Chain Pro	Foaming Chain and Cable Lubricant	273	Fl. Oz.
Drill	C255	Chemsearch Lubrease	Chain and Cable Lube	195	Fl. Oz.
Drill	C255	Cheansearch NC-123 Plus	Moisture Displaler for Electrical Equipment	99	Fl. Oz.
Drill	C255	Multi Mist Durahold	Contact Adheasive	68	Fl. Oz.
Drill	C255	Opti Grow	Wasp A Foam Advanced Bee Spray	332.5	Fl. Oz.
Drill	C255	Chemsearch Super Swat II	Insect Repelent	44	Fl. Oz.
Drill	C255	Chemsearch Pow Plus	Bee Spray	210	Fl. Oz.
Drill	C255	Chemsearch Conquest	Chemical Rust Converter	60	Fl. Oz.
Drill	C255	Chemsearch Soludize	Lubricant	6	Gal
Drill	C255	Chemsearch High Core	Wire Rope & Chain Conditioner with Molysol	4	Gal
Drill	C255	Chemsearch Pro Vantage	Hydraulic Oil Improver	6	Gal
Drill	C255	Chemsearch Artic Action	Heavy Duty Windshield Cleaner	2	Gal
Drill	C255	Chemsearch Citrus Fullback	Heavy Duty Citrus Cleaner	7	Gal
Drill	C255		Grease Tubes for Grease Guns	44	Tubes
Drill	C255	Chemsearch B-lube	Belt Dressing	16	Fl. Oz.
Drill	C255	Chemsearch Trump	Heavy Duty Grease	14	Fl. Oz.
Drill	C255	Chemsearch Rust Block	Rust Preventor	13	Fl. Oz.
Drill	C255	Chemsearch Lexite NF	Electrical Contact Moisture Inhibitor	15	Fl. Oz.
Drill	C255	Chemsearch Dimon	Silicone Lube	11	Fl. Oz.
Drill	C255	Chemsearch MRX-70	Liquid Mud and Silt Remover	16	Fl. Oz.
Drill	Pole Bldg		Anti Freeze	55	Gal
Drill	Pole Bldg	LPS	Lubricant	55	Gal
Drill	Pole Bldg	Silica Sand	Silica Sand	1	Pallet
Drill	Pole Bldg	High Core	Rust Inhibitor	20	Gal

Appendix 3

Chemical Segregation & Incompatibilities Guidelines

Class of Chemical	Examples	Recommended Storage Method	Incompatible Materials	Possible Reaction If Mixed
Corrosive Acids 	**Mineral Acids –** Chromic Acid Hydrogen Chloride Hydrochloric Acid Nitric Acid Perchloric Acid Phosphoric Acid Sulfuric Acid	Separate cabinet or storage area away from potential water sources, i.e. under sink	Flammable Liquids Flammable Solids Bases Oxidizers Poisons	Heat   Gas Generation  Violent Reaction
Corrosive Bases/ Caustics 	Ammonium Hydroxide Sodium Hydroxide Sodium Bicarbonate	Separate cabinet or storage area away from potential water sources, i.e. under sink	Flammable Liquids Flammable Solids Acids Oxidizers Poisons	 Heat  Gas Generation  Violent Reaction
Explosives 	Ammonium Nitrate Nitro Urea Picric Acid Trinitroaniline Trinitrobenzene Trinitrobenzoic Acid Trinitrotoluene Urea Nitrate	Secure location away from other chemicals	Flammable Liquids Oxidizers Poisons Acids Bases	Explosion Hazard 

Class of Chemical	Examples	Recommended Storage Method	Incompatible Materials	Possible Reaction If Mixed
Flammable Liquids 	Acetone Benzene Diethyl Ether Methanol Ethanol Toluene Glacial Acetic Acid	Grounded flammable storage cabinet of flammable storage refrigerator	Acids Bases Oxidizers Poisons	 Fire Hazard Heat   Violent Reaction
Flammable Solids 	Phosphorus Magnesium	Separate dry cool area	Acids Bases Oxidizers Poisons	Fire Hazard Heat    Violent Reaction
Oxidizers 	Sodium Hypochlorite Benzoyl Peroxide Potassium Permanganate Potassium Chlorate Potassium Dichromate Peroxides Perchlorates Chlorates Nitrates	Spill tray that is separate from flammable and combustible materials	Reducing Agents Flammables Combustibles Corrosives	 Fire Hazard Toxic Gas Generation 
Poisons 	Cyanides Cadmium Mercury Osmium Acrylamide DMSO	Vented, cool, dry area in unbreakable chemically resistant secondary containers	Flammable Liquids Acids Bases Oxidizers Corrosives	Generation of Toxic & Flammable Gas   Violent Reaction
Water Reactive Chemicals 	Sodium Metal Potassium Metal Lithium Metal Lithium Aluminum Hydride	Dry, cool location away from potential spray from fire sprinklers and other water sources, i.e. under sink	Aqueous Solutions Oxidizers	Heat   Violent Reaction

Class of Chemical	Examples	Recommended Storage Method	Incompatible Materials	Possible Reaction If Mixed
Flammable Compressed Gases 	Methane Acetylene Propane Hydrogen	Cool, dry area away from oxidizing gases while securely attached to wall or bench	Oxidizing & Toxic Compressed Gases Oxidizing Solids	Fire Hazard  Explosion Hazard 
Oxidizing Compressed Gases 	Oxygen Chlorine Bromine	Cool, dry area away from flammable gases while securely attached to wall or bench	Flammable Gases	Fire Hazard  Explosion Hazard 
Poisonous Compressed Gases 	Carbon Monoxide Hydrogen Sulfide	Cool, dry area away from flammable gases or liquids while securely attached to wall or bench	Flammable Gases Oxidizing Gases	Release of Toxic Gas   Violent Reaction

Partial Incompatibility Listing

Compound/Class	Avoid Storage Near or Contact With:
Acids	
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene, glycogen, perchloric acid, peroxides, permanganate
Hydrofluoric Acid	Ammonia (aqueous or anhydrous)
Nitric Acid (conc.)	Acetic acid, aniline, chromic acid, acetone, alcohol, or other flammable liquids, hydrocyanic acid, hydrogen sulfide, or other flammable gases, nitratable substances: copper, brass or any heavy metals (or will generate nitrogen dioxide/nitrous fumes) or organic products such as wood and paper
Sulfuric Acid	Light metals (lithium, sodium, potassium), chlorates, perchlorates, permanganates
Bases	
Ammonia	Mercury, chlorine, bromine, iodine, hydrofluoric acid, calcium hypochlorite
Calcium oxide	Water
Alkaline metals	Sodium, potassium, magnesium, calcium, aluminum, carbon dioxide, carbon tetrachloride or other chlorinated hydrocarbons, halogens, water
Bromine	Ammonia, acetylene, butadiene, methane, propane, butane (or other petroleum gases), hydrogen, sodium carbide, turpentine, benzene, finely divided metals
Carbon, activated	Calcium hypochlorite, oxidizing agents
Chlorine	Ammonia, acetylene, butadiene, methane, propane, butane, or other petroleum gases, hydrogen, sodium carbide, turpentine, benzene, finely divided metals
Copper	Acetylene, hydrogen peroxide, nitric acid
Fluorine	Isolate from everything
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, ammonia, fulminic acid (produced in nitric acid ethanol mixtures)
Oxygen	Oils, grease, hydrogen, other flammable gases, liquids, or solids
Phosphorous (white)	Air, oxygen, caustic alkalis as reducing agents (or will generate phosphine)
Potassium	Carbon tetrachloride, carbon dioxide, water
Silver	Acetylene, oxalic acid, tartaric acid, fulminic acid (produced in nitric acid-ethanol mixtures), and ammonium compounds

Compound/Class	Avoid Storage Near or Contact With:
Organics	
Acetone	Concentrated nitric acid and sulfuric acid mixtures
Acetylene	Fluorine, chlorine, bromine, copper, silver, mercury
Aniline	Nitric acid, hydrogen peroxide
Flammable Liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Hydrocarbons	Fluoride, chlorine, bromine, chromic acid, sodium peroxide (propane, butane, etc.)
Nitroparaffins	Inorganic bases, amines
Oxalic Acid	Silver, mercury
Oxidizers	
Chlorates	Ammonia salts, acids, metal powders, sulfur, finely divided organics, or combustible materials
Chromic Acid (trioxide)	Acetic acid, naphthalene, camphor, glycerol, turpentine, alcohol or flammable liquids
Ammonium Nitrate	Acids, metal powders, flammable liquids, chlorates, nitrates, sulfur, finely divided organic or combustible materials
Chlorine Dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Cumene Hydroperoxide	Organic or inorganic acids
Hydrogen Peroxide	Copper, chromium, iron, most other metals or salts, alcohols, acetone, or other flammable liquids, aniline, nitromethane, or other organic or combustible materials
Hypochlorites	Acids (will generate chlorine or hypochlorous acid
Nitrates	Sulfuric acid (will generate nitrogen dioxide)
Perchloric Acid	Acetic acid, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides (Organics)	Organic or inorganic acids; also avoid friction and store cold
Potassium Chlorate	Acids, especially sulfuric acid
Potassium Permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Sodium Peroxide	Any oxidizable substance such as methanol, ethanol, glycerol, ethylene glycol, glacial acetic acid, acetic anhydride, benzaldehyde, furfural, methyl acetate, ethyl acetate, carbon disulfide
Alkaline metals	Sodium, potassium, magnesium, calcium, aluminum, carbon dioxide, carbon tetrachloride or other chlorinated hydrocarbons, halogens, water
Calcium oxide	Water
Cyanides	Acids (will generate hydrogen cyanide)
Phosphorous (white)	Air, oxygen, caustic alkalis as reducing agents (will generate phosphine)
Potassium	Carbon tetrachloride, carbon dioxide, water
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium Peroxide	Any oxidizable substance such as methanol, ethanol, glycerol, ethylene glycol, glacial acetic acid, acetic anhydride, benzaldehyde, furfural, methyl acetate, ethyl acetate, carbon disulfide
Sulfides	Acids (will generate hydrogen sulfide)

Compound/Class	Avoid Storage Near or Contact With:
Reducing Agents	
Hydrazine	Hydrogen peroxide, nitric acid, other oxidants
Nitrites	Acids (will generate nitrous fumes)
Sodium Nitrite	Ammonium nitrate and other ammonium salts
Toxics/Poisons	
Arsenicals	Reducing agents (will generate arsine)
Azides	Acids (will generate hydrogen azide)
Cyanides	Acids (will generate hydrogen cyanide)
Hydrocyanic Acid	Nitric Acid, alkalis
Hydrogen Sulfide	Fuming nitric acid, oxidizing gases
Selenides	Reducing agents (will generate hydrogen selenide)
Sulfides	Acids (will generate hydrogen sulfide)
Tellurides	Reducing agents (will generate hydrogen telluride)

Appendix 4

Flammables

General Characteristics

- Flammable liquids are the most commonly found chemicals in a laboratory. Flammables can readily catch fire and burn. It is the vapor of a flammable liquid that burns, not the liquid itself.
- The rate at which a flammable liquid produces flammable vapors depends on its vapor pressure: the higher the vapor pressure, the more readily the liquid will vaporize. A chemical's vapor pressure also increases with increasing temperature. This makes flammable chemicals more hazardous when heated.
- The flash point of a chemical is that minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air. Many commonly used flammables have flash points lower than room temperature; for example, diethyl ether (flash point of –45.0ºC), acetone (flash point of –17.8ºC), and isopropyl alcohol (flash point of 11.7ºC). Acetone and MEK are examples of extremely flammable chemicals used at the Mats Lab.
- As flammable chemicals evaporate, the chances for ignition increase significantly. Tightly seal all flammable materials into appropriate containers and store accordingly. The limits of flammability or explosivity define the range in which a flammable vapor or gas can ignite and burn when mixed with air. The low end of this range is called the lower explosive limit or LEL; the high end of this range is called the upper explosive limit or UEL. If the vapor concentration in air is below the LEL or above the UEL, the mixture will not burn, but if the concentration is within these limits there is a very high risk of an explosion. The vapor in air concentration must be within the limits of flammability in order for it to ignite and burn.
- Some flammable chemicals, such as benzene, have a very narrow flammability range, while others, such as acetaldehyde, have a very wide flammability range.
- Most flammable vapors have a vapor density that is greater than that of air. The result is that these vapors will seek the lowest elevations. Flammable vapors can also travel great distances.
- Eliminate all potential and surrounding ignition sources when working with flammables.

Use and Storage

- Store flammable liquids that are not in use in safety cans, storage cabinets designed for flammables, or inside storage rooms.
- Minimize the amount of flammable liquids stored in the lab.
- Use flammables only in an area free of ignition sources. Remember, smoking is not permitted anywhere inside the building.
- When transferring flammables in metal containers, voltage potentials can result in static sparks capable of igniting flammable vapors. Flammable liquid dispensing and receiving containers must be bonded together before pouring. Large containers such as drums must also be grounded when used as a dispensing or receiving vessel. All grounding and bonding connections must be metal to metal. Safety catalogs offer the necessary bonding and grounding wires.
- Never heat flammables by using an open flame. Use steam baths, water baths, oil baths, heating mantles, or hot air baths.
- Never store flammable chemicals in a standard household refrigerator. There are several ignition sources located inside a standard refrigerator that can set off a fire or violent explosion.

- When flammables are to be stored cold, use only a lab safe or explosion-proof refrigerator. Another alternative is to use an ice bath to chill the chemicals. Remember, there is no safety benefit in storing a flammable chemical in a refrigerator if the flash point of that chemical is below the temperature of the refrigerator.

Health Hazards

In general, the vapors of many flammables are irritating to mucous membranes of the respiratory system and eyes, and in high concentrations are narcotic. The following symptoms are typical for the respective routes of entry.

Acute Health Effects

- Inhalation – headache, fatigue, dizziness, drowsiness, narcosis (stupor and unresponsiveness)
- Ingestion – slight gastro-intestinal irritation, dizziness, fatigue
- Skin Contact – dry, cracked, and chapped skin
- Eye Contact – stinging, watering eyes, and inflammation of the eyelids

Chronic Health Effects

The chronic health effects will vary depending on the specific chemical, the duration of the exposure, and the extent of the exposure. However, damage to the lungs, liver, kidneys, heart, and/or central nervous system may occur. Cancer and reproductive effects are also possible. The following groups of flammables exhibit similarities in health effects:

- Hydrocarbons – aliphatic hydrocarbons are narcotic but their systemic toxicity is relatively low. Aromatic hydrocarbons are all potent narcotic agents and overexposure to the vapors can lead to loss of muscular coordination, collapse, and unconsciousness. Benzene is toxic to bone marrow and can cause leukemia.
- Alcohols – vapors only moderately narcotic.
- Ethers – exhibit strong narcotic properties and for the most part are only moderately toxic.
- Esters – vapors may result in irritation to the eyes, nose, and upper respiratory tract.
- Ketones – systemic toxicity is generally not high.

First Aid

The following first aid measures are generally applicable to flammables. For more information on specific chemicals, consult the MSDS for that chemical.

Routes of Entry	First Aid Measure
Inhalation	• Remove person from the contaminated area if it is safe to do so • Get medical attention and do not leave person unattended
Ingestion	• Remove the person from the source of contamination • Get medical attention. Do not induce vomiting.
Skin contact	• Remove person from source of contamination • Remove clothing, jewelry, and shoes from the affected areas • Flush the affected area with water for at least 15 minutes • Get medical attention
Eye contact	• Remove person from the source of contamination • Flush the eyes with water for at least 15 minutes • Get medical attention

Personal Protective Equipment

- Always use a fume hood while working with flammable liquids
- Nitrile and neoprene gloves are effective against most flammables
- Wear a non-flammable lab coat to provide a barrier to your skin, and goggles if splashing is likely to occur.

Oxidizers

General Characteristics

- Oxidizers or oxidizing agents present fire and explosion hazards on contact with combustible materials. Depending on the class, an oxidizing material may: increase the burning rate of combustibles with which it comes in contact; cause the spontaneous ignition of combustibles with which it comes in contact; or undergo an explosive reaction when exposed to heat, shock, or friction.
- Oxidizers are generally corrosive.
- *Do not order or use anhydrous perchloric acid.* It is unstable at room temperature and can decompose spontaneously with a severe explosion. Anhydrous perchloric acid will explode in contact with wood or other organic materials.
- Perchloric acid is an oxidizing agent of particular concern. The oxidizing power of perchloric acid increases with an increase in concentration and with an increase in temperature. Cold, 70% perchloric acid is a strong, non-oxidizing corrosive. A 72% perchloric acid solution at elevated temperatures is a strong oxidizing agent. A 85% perchloric acid solution is a strong oxidizer at room temperature.

Use and Storage

- In general, store oxidizers away from flammables, organic compounds and combustible materials.
- Strong oxidizing agents like chromic acid should be stored in glass or some other inert container, preferably unbreakable. Corks and rubber stoppers should not be used.
- Reaction vessels containing appreciable amounts of oxidizing material should never be heated in oil baths, but rather on a heating mantle or sand bath.

Health Hazards

Oxidizers have been chosen as a group primarily due to their potential to add to the severity of a fire or to initiate a fire. But there are some generalizations that can be made regarding the health hazards of an oxidizing material. In general, oxidizers are corrosive and many are highly toxic.

Acute Health Effects

Some oxidizers such as nitric and sulfuric acid vapors, chlorine, and hydrogen peroxide act as irritant gases. All irritant gases can cause inflammation in the surface layer of tissues when in direct contact. They can also cause irritation of the upper airways, conjunctiva, and throat. Some oxidizers, such as fluorine, can cause severe burns of the skin and mucus membranes. Chlorine trifluoride is extremely toxic and can cause severe burns to tissue. Nitrogen trioxide is very damaging to tissue especially the respiratory tract. The symptoms from an exposure to nitrogen trioxide may be delayed for hours, but fatal pulmonary edema may result.

Chronic Health Effects

Nitrobenzene and chromium compounds can cause hematological and neurological changes. Compounds of chromium and manganese can cause liver and kidney disease. Chromium VI compounds have been associated with lung cancer.

First Aid

In general, if a person has inhaled, ingested, or has come into direct contact with these materials the person must be removed from the source of contamination as quickly as possible, if it is safe to do so. Medical help must be summoned. In the case of an exposure directly to the skin or eyes it is imperative that the exposed person be taken to an emergency shower or eyewash immediately. Flush the affected area for a minimum of 15 minutes then get medical attention.

Personal Protective Equipment

- Safety eyewear is always required while working in the labs and when handling oxidizers.
- Always use a chemical fume hood because most oxidizers pose a hazard through the inhalation route
- In many cases, the glove of choice will be neoprene, polyvinyl chloride (PVC), or nitrile
- Be sure to consult a glove compatibility chart to ensure the glove material is appropriate for the particular chemical you are working with. Also, the glove manufacturer can be consulted for additional information.
- Chemical splash goggles must be worn if the potential for splashing exists or if exposure to vapor or gas is likely.

Corrosives

General Characteristics

- Corrosives are most commonly acids and alkalis, but many other materials can also be severely damaging to living tissue
- Corrosives can cause visible destruction or irreversible alterations at the site of contact
- Inhalation of the vapor or mist can cause severe bronchial irritation. Corrosives are particularly damaging to the skin and eyes.
- Certain substances considered non-corrosive in their natural dry state are corrosive when wet, such as when in contact with moist skin or mucus membranes. Examples of these materials are lithium chloride, halogen fluorides, and allyl iodide.
- Sulfuric acid is a very strong dehydrating agent and nitric acid is a strong oxidizing agent
- Dehydrating agents can cause severe burns to the eyes because of their affinity for water.

Use and Storage

- Always store acids separately from bases. Also, store acids away from flammables, because many acids are also strong oxidizers
- Do not work with corrosives unless an emergency shower and continuous flow eyewash are available
- Always add acid to water, never add water to acid. This is to prevent splashing from the acid because of the generation of excessive heat as the two substances mix.
- Never store corrosives above eye level. Store on a low shelf or cabinet.
- It is a good practice to store corrosives in a tray or bucket to contain any leakage.
- When possible, purchase corrosives in containers that are coated with a protective plastic film that will minimize the danger to personnel if the container is dropped.
- Store corrosives in a wooden cabinet or one that has a corrosion-resistant lining. Corrosives stored in a metal cabinet will quickly damage it and if the supports that hold up the shelves become corroded, the result could be disastrous.

Health Hazards

All corrosives possess the property of being severely damaging to living tissues (e.g., skin and eyes). They also attack other materials, such as metal. Skin contact with alkali metal hydroxides (for example, sodium hydroxide and potassium hydroxide) is more dangerous than with strong acids. Contact with alkali metal hydroxides normally causes deeper tissue damage because there is less pain than with an acid exposure. The exposed person may not wash it off thoroughly enough or seek prompt medical attention. On contact with skin, acids generally form a protein layer that prevents further penetration and is painful, whereas alkali metal hydroxides do not form this layer.

All hydrogen halides are acids that are serious respiratory irritants and also cause severe burns. Hydrofluoric acid is particularly dangerous. At low concentrations, hydrofluoric acid does not immediately show any signs or symptoms upon contact with skin. It may take several hours for the hydrofluoric acid to penetrate the skin before you would notice a burning sensation. However, by this time permanent damage, such as second and third degree burns with scarring, can result.

Acute Health Effects

- Inhalation - irritation of mucus membranes, difficulty in breathing, fits of coughing, pulmonary edema
- Ingestion - irritation and burning sensation of lips, mouth, and throat; pain in swallowing; swelling of the throat; painful abdominal cramps; vomiting; shock; risk of perforation of the stomach
- Skin Contact - burning, redness and swelling, painful blisters, profound damage to tissues, and with alkalis a slippery, soapy feeling
- Eye Contact - stinging, watering of eyes, swelling of eyelids, intense pain, ulceration of eyes, loss of eyes or eyesight.

Chronic Health Effects

Symptoms associated with a chronic exposure vary greatly depending on the chemical. For example, the chronic effect of hydrochloric acid is damage to the teeth; the chronic effects of hydrofluoric acid are increased bone density, fluorosis, and anemia; the chronic effects of sodium hydroxide are unknown.

First Aid

The following first aid measures are generally applicable to corrosives. For more information on specific chemicals, consult the MSDS for that chemical.

Routes of Entry	First Aid Measure
Inhalation	• Remove person from the contaminated area if it is safe to do so. • Get medical attention and do not leave person unattended.
Ingestion	• Remove the person from the source of contamination. Get medical attention. • Do not induce vomiting.
Skin contact	• Remove person from the source of contamination and take immediately to an emergency shower or source of water. • Remove clothing, shoes, socks and jewelry from affected areas as quickly as possible, cutting them off if necessary. Be careful not to get any chemical on your skin or inhale the vapors. • Flush the affected area with water for a minimum of 15 minutes. Get medical attention.
Eye contact	• Remove person from source of contamination and take immediately to an eyewash or source of water. • Rinse the eyes for a minimum of 15 minutes. Have the person rotate his or her eyes up and down and from side to side while flushing with water. • Get medical attention. • Do not let person rub his or her eyes or keep them tightly shut.

Personal Protective Equipment

- Always use corrosives in a chemical fume hood
- Always wear the proper gloves when working with acids
- Neoprene and nitrile gloves are effective against most acids and bases
- PVC is also effective for most acids

- A rubber-coated apron is effective
- Wear goggles. If splashing is likely to occur, wear a face shield over the goggles.

Reactives

General Characteristics

Polymerization Reactions

Polymerization is a chemical reaction in which two or more molecules of a substance combine to form repeating structural units of the original molecule. This can result in an extremely high or uncontrolled release of energy. An example of a chemical which can undergo a polymerization reaction is polyvinylbenzene.

Water Reactive Materials

1. When water reactive materials come in contact with water, one or more of the following can occur: liberation of heat which may cause ignition of the chemical itself if it is flammable, or ignition of flammables that are stored nearby; release of a flammable, toxic, or strong oxidizing gas; release of metal oxide fumes; and formation of corrosive acids.

2. Water reactive chemicals can be particularly hazardous to fire fighting personnel responding to a fire in a lab, because water is the most commonly used fire extinguishing medium.

3. Examples of water reactive materials:
- alkali metals (e.g., lithium)
- silanes
- sodium, potassium
- alkylaluminums
- magnesium
- zinc
- aluminum

Pyrophorics

1. Pyrophoric materials can ignite spontaneously in the presence of air.
2. Examples of pyrophoric materials:
- diethylzinc
- triethylaluminum
- many organometallic compounds

Peroxide-Forming Materials

1. Peroxides are very unstable, and some chemicals that can form them are commonly used in laboratories. This makes peroxide-forming materials some of the most hazardous substances found in a lab. Peroxide-forming materials are chemicals that react with air, moisture, or impurities to form organic peroxides. Peroxide formation by most of these materials is greatly increased by evaporation or distillation. Organic peroxide compounds are extremely sensitive to shock, sparks, heat, friction, impact, and light. Many peroxides formed from materials used in laboratories are more shock sensitive than TNT. Just the friction from unscrewing the cap of a container of an ether that has peroxides in it can provide enough heat to cause a severe explosion.
2. Examples of peroxide forming materials (the first group listed is the most hazardous):
- isopropyl ether divinylacetylene
- sodium amide potassium amide

- dioxane diethyl ether
- tetrahydrofuran vinyl ethers
- butadiene vinylpyridine
- acrylonitrile styrene

Other Shock-Sensitive Materials

1. These materials are explosive and are sensitive to heat and shock.
2. Examples of other shock sensitive materials:

- chemicals containing nitro groups
- fulminates
- hydrogen peroxide (30% +)
- ammonium perchlorate
- benzoyl peroxide (when dry)
- Compounds containing the following functional groups: acetylide, azide, diazo, halamine, nitroso, and ozonide.

Use and Storage

- A good way to reduce the potential risks is to minimize the amount of material used in the experiment. Use only the amount of material necessary to achieve the desired results.
- Always substitute a less hazardous chemical for a highly reactive chemical whenever possible. If it is necessary to use a highly reactive chemical, only order the amount that is necessary for the work.

Water Reactive Materials

Store water-reactive chemicals in an isolated part of the lab. A cabinet away from any water sources, such as sinks, emergency showers, and chillers, is an appropriate location. Clearly label the cabinet "Water-Reactive Chemicals – No Water".

Pyrophorics

Store pyrophorics in an isolated part of the lab and in a clearly marked cabinet. Be sure to routinely check the integrity of the container and have the material disposed if the container is corroded or otherwise damaged.

Peroxide-Forming Materials

- Do not open the chemical container if peroxide formation may have occurred. The act of opening the container could be sufficient to cause a severe explosion. Visually inspect liquid peroxide-forming materials for crystals or unusual viscosity before opening. Pay special attention to the area around the cap. Peroxides usually form upon evaporation, so they will most likely be formed on the threads under the cap.
- Date all peroxide forming materials with the date received, opened, and the expected shelf life. Chemicals such as isopropyl ether, divinyl acetylene, sodium amide, and vinylidene chloride should be discarded after three months. Chemicals such as dioxane, diethyl ether, and tetrahydrofuran should be discarded after one year.
- Store all peroxide forming materials away from heat, sunlight, and sources of ignition. All organic peroxides are highly flammable and sunlight accelerates the formation of peroxides.
- Secure the lids and caps on these containers to discourage the evaporation and concentration of these chemicals.
- Never store peroxide-forming materials in glass containers with screw cap lids or glass stoppers. Friction and grinding must be avoided. Also, never store these chemicals in a clear glass bottle where they would be exposed to light.

- A test can be performed to check for the presence of peroxides in ethers. However, if you suspect that peroxides may be present, it is probably wise to call the hazardous waste disposal vendor for disposal. If you notice crystal formation in the container or around the cap, do not attempt to open or move the container.
- Never distill ether unless it is known to be free of peroxides.

Other Shock Sensitive Materials

- Store these materials separately from other chemicals and in a clearly labeled cabinet.
- Never allow picric acid to dry out; it is extremely explosive. Always store picric acid in a wetted state.

Health Hazards

Reactive chemicals are grouped together as a category primarily because of the safety hazards associated with their use and storage and not because of similar acute or chronic health effects. For health hazard information on specific reactive materials consult the MSDS or the manufacturer. However, there are some hazards common to the use of reactive materials. Injuries can occur due to heat or flames; hearing loss can result; respiratory injuries can occur due to inhalation of fumes, vapors, and reaction products; and a very serious hazard is flying debris which can inflict physical injuries.

First Aid

If someone is seriously injured the most important step to take is to contact emergency responders as quickly as possible. Explain the situation clearly and accurately.
If someone is severely bleeding apply a sterile dressing, clean cloth, or handkerchief to the wound. Place the palm of your hand directly over the wound and apply pressure. Continue to apply pressure until help arrives and keep the person calm. If a person is on fire, have them drop immediately to the floor and roll. If a fire blanket is available put it over them. An emergency shower can also be used to douse flames if one is immediately available. If a person is going into shock, have them lie down on their back if it is safe to do so and raise the feet about one foot above the floor.

Personal Protective Equipment

Wear appropriate personal protective clothing while working with highly reactive materials. This might include: impact resistant chemical splash goggles, a face shield, gloves, a lab coat (to minimize injuries from flying glass or an explosive flash), and a shield. Conduct work within a chemical fume hood as much as possible and pull down the sash as far as is practical. When the experiment does not require you to reach into the fume hood, keep the sash closed. Barriers can offer protection of personnel against explosions and should be used. Many safety catalogs offer commercial shields which are commonly polycarbonate and are weighted at the bottom for stability. It may be necessary to secure the shields firmly to the work surface.

Toxins

General Characteristics

- Any chemical at the right dose could be toxic to humans; however, some chemicals are known to be hazardous at very low concentrations, over a very short exposure time, or after repeated exposures. These chemicals are the toxins, poisons, and carcinogens.
- A toxin may be mutagenic and cause a heritable change in the gene structure, or may also be teratogenic and cause a malformation of an embryo. Pregnant women and persons in their childbearing years should not work with or, at a minimum, use extreme caution while handling these materials.
- The toxicity of a material is a result of its ability to interfere with the metabolism of living tissue. An acute toxin can cause an adverse effect after a single or short duration exposure. A chronic toxin causes an adverse effect after repeated exposures, after a long duration single exposure, or after a long latency period. Carcinogens are examples of chronic toxins that have a long latency period before the effects of the exposure are observed.

Use and Storage

- All exposure to chemicals that are known to be highly toxic must be minimized by substituting a less hazardous chemical, decreasing the exposure time to the chemical, wearing protective clothing, practicing safe laboratory techniques, and using properly functioning laboratory safety equipment, such as fume hoods or biological safety cabinets, as appropriate.
- Do not eat, drink, smoke or apply cosmetics in an area where toxic chemicals are used or stored, or without washing hands after using such chemicals.
- Thoroughly wash your hands and arms before leaving the work area and at the end of the day. Store containers of toxic materials in pans, trays, or other secondary containers to minimize hazards if the containers were to break or the contents spill.
- Use absorbent paper on the work surface to contain spills.
- Restrict access where toxic materials are used and post signs if special toxicity hazards exist.
- Vacuum pumps that are used with materials having high chronic toxicity should be protected by high-efficiency scrubbers or high-efficiency particulate air (HEPA) filters and vented into a chemical fume hood.
- Store toxic chemicals separately in a clearly labeled cabinet. Do not allow personnel to work with toxins until they have been properly trained in their hazards, use, storage and proper handling. If other hazards also apply to toxic chemicals, store as appropriate to those hazards.

Health Hazards

The health hazards of toxic materials vary greatly. For information on specific chemicals, consult the MSDS for that chemical.

First Aid

1. Remove the person from the source of contamination if it is safe to do so.
2. Get medical attention immediately.
3. Try to determine exactly what the person has been exposed to and provide this information to the emergency responders.
4. Provide a copy of the MSDS to the emergency responders if at all possible.

Personal Protective Equipment

- Protect your skin, eyes, and respiratory tract by using the appropriate engineering controls, such as fume hoods and glove boxes, and by using personal protective clothing such as gloves and lab coats.
- Make sure that the fume hood is in proper working condition. When in doubt, contact the Safety and Health Services Office to have the fume hood tested.

Compressed Gas

General Characteristics

- Cylinders of compressed gases can pose a chemical hazard as well as a physical hazard.
- If the valve were to break off a cylinder, the amount of force present could propel the cylinder through a brick wall.

Use and Storage

- Use toxic, flammable, or reactive gases only in a fume hood or other ventilated enclosure.
- Always use the appropriate regulator on a cylinder. If a regulator will not fit a cylinder's valve, replace the cylinder, not the regulator. Do not ever attempt to adapt or modify a regulator to fit a cylinder it was not designed for. Regulators are designed to fit only specific cylinder valves to avoid improper use.
- Inspect regulators, pressure relief devices, valves, cylinder connections, and hose lines frequently for damage.
- Never accept or use a cylinder that cannot be positively identified. Color coding is not a reliable way of identifying a cylinder because the colors can vary from supplier to supplier.
- Do not use oil or grease on any cylinder component of an oxidizing gas because a fire or explosion can result.
- Never transfer gases from one cylinder to another. The gas may be incompatible with the residual gas remaining in the cylinder, or may be incompatible with the material that the cylinder is made of.
- Never completely empty cylinders; rather, leave approximately 25 psi of pressure. This will prevent any residual gas in the cylinder from becoming contaminated.
- Place all cylinders so that the main valve is always accessible.
- Close the main cylinder valve whenever the cylinder is not in use.
- Remove regulators from unused cylinders and always put the safety cap in place to protect the valve.
- **Always secure cylinders, whether empty or full**, to prevent them from falling over and damaging the valve (or falling on your foot). Secure cylinders by chaining or strapping them to a wall, lab bench, or other fixed support.
- Oxygen should be stored in an area that is at least 20 feet away from any flammable or combustible materials or separated from them by a noncombustible barrier at least 5 feet high and having a fire-resistance rating of at least 1/2 hour.
- To transport a cylinder, put on the safety cap and strap the cylinder to a hand truck in an upright position. Never roll a cylinder.
- Always clearly mark empty cylinders and store them separately.
- Be careful while handling compressed gas cylinders, and never drop or strike a cylinder against anything
- Use only wrenches or other tools supplied by the cylinder supplier to open a valve. Open cylinder valves slowly.

Carcinogens or Suspected Carcinogens

General Characteristics

Carcinogens are chemicals that are known or suspected to cause tumors in mammalian species.

Use and Storage

If the laboratory unit is using, repackaging, releasing, handling, or storing any of the carcinogens listed in WAC 296-62-07302 (see below list of Carcinogens) and the carcinogens (solid or liquid) that are 0.1 percent or greater by weight or volume, the Section Supervisor must:

- Establish a designated area (an area that can be used for work with carcinogens, reproductive toxins, or substances that have a high degree of acute toxicity. The designated area can be a fixed piece of equipment such as a fume hood, or a small room or enclosure)
- Establish a regulated area (an area where entry and exit is restricted and controlled)
- Post sign at entrance to regulated area stating:

CANCER SUSPECT AGENT AUTHORIZED PERSONNEL ONLY

- Protect laboratory vacuum systems with high- efficiency scrubbers or disposable absolute filters (if applicable)
- Perform a hazard assessment (see Chapter 4.6 Personal Protective Equipment). Provide and require employees to wear a clean change of appropriate laboratory clothing (for example, solid front gown, surgical scrub suit, fully buttoned lab coat, etc.);
- Require employees, prior to exiting from a regulated area, to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day. Place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. Containers must be labeled with the full chemical name, Chemical Abstracts Service Registry number, and have the warning words “cancer-suspect agent” displayed. Containers with carcinogenic contents with corrosive or irritating properties must be labeled with statements warning of such hazards and, if appropriate, note particularly sensitive or affected portions of the body.
- DO NOT REMOVE CONTAMINATED CLOTHING FROM THE REGULATED AREA AND LAUNDER AT HOME.
- Require employees to wash hands, forearms, face and neck upon each exit from the regulated area close to the point of exit, and before engaging in other activities.
- Ensure air pressure in the laboratory area is negative in relation to the pressure in the surrounding area. Exhaust air should not be discharged to regulated areas, non-regulated areas, or the external environment unless decontaminated. There should be no connection between the regulated area and any other area through the ventilation system.
- Maintain current inventories of the listed carcinogens.
- Ensure fume hoods are tested semi-annually by Facilities and Equipment Management Operations.

List of Carcinogens or Suspected Carcinogens

OSHA designates the following chemicals as carcinogens and which must be handled in "designated areas"

1. 2-Acetylaminofluorene
2. 4-Aminodiphenyl
3. Acrylonitrile
4. Arsenic (inorganic)*
5. Asbestos
6. Benzene*
7. Benzidine
8. Cadmium – all forms
9. bis-Chloromethyl ether
10. 3,3-Diclhlorobenzidene and its salts
11. 4-Dimethylaminoazobenzene
12. Ethyleneimine
13. Ethylene Oxide
14. Formaldehyde*
15. Methyl chloromethyl ether
16. Methylenedianiline
17. Nitrosodimethylamine
18. alpha-Napthylamine
19. beta-Napthylamine
20. 4-Nitrophenyl
21. beta-Propiolactone
22. Vinyl chlorid

*Chemicals currently used at Materials Lab

Additional chemicals known to be human carcinogens (As designated in NTP sixth Annual Report on Carcinogens)

1. Aflatoxins
2. Analgesic Mixtures containing Phenacetin
3. Azathioprine
4. 1,4-Butanediol Dimethylsulfonate (Myerlan)
5. Chlorambucil
6. 1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea (MeCCNU)
7. Chromium and Certain Chromium Compounds (Hexavalent Chromium)
8. (examples are: calcium, lead, strontium, and zinc chromates, and chromium dioxide)
9. Conjugated estrogens
10. Cyclophosphamide
11. Diethylstilbestrol (DES)
12. Erionite
13. Melphalan
14. Mustard Gas
15. Thorium Dioxide

Personal Protective Equipment

The required PPE, such as respirators, gloves, and lab coats, will vary depending on the physical characteristics of the chemical's carcinogenicity, and the regulated area (for example, working in open air versus working in a fume/exhaust hood).

Any other use of the carcinogen, such as for one used in a fume hood (which requires written approval), will require wearing clean, full-body protective clothing, shoe covers, and gloves prior to entering the regulated area. Washing procedures required for employees handling confirmed carcinogens are that their hands and arms must be washed upon completion of work and before engaging in other activities.

A sink, soap, and clean towels for washing shall be provided in the area just outside of the regulated area of the lab. Towels shall be laundered with lab coats on a weekly basis through a laundry service.

Training

Only authorized personnel or individuals wearing appropriate safety clothing and equipment and escorted by authorized personnel are allowed into regulated areas. Authorized personnel must receive training and indoctrination prior to being authorized to enter a regulated area. This training must include the following:

- The specific nature of the operation involving carcinogens that could result in exposure. Other operations involving the use of a confirmed carcinogen require written approval and specific procedures for its use and decontamination needs prior to any handling other than storage.
- Purpose for and application of the medical surveillance program including, as appropriate, methods of self-examination. This includes a pre-assignment examination and an exam every 3 years with a questionnaire exam the other 2 years.
- Purpose for and application of decontamination practices and procedures.
- Purpose for and significance of emergency practices and procedures.
- The employee's specific role in emergency procedures.
- Specific information to aid the employee in recognition and evaluation of conditions and situations that may result in the release of confirmed carcinogens.
- The purpose for and application of specific first-aid procedures and practices.
- A review of this section at the employee's first training and indoctrination program and annually thereafter.

Appendix 5

Chemical Handling Sheet - Hydrofluoric Acid Handling

Purpose

Because of its hazards, hydrofluoric acid (HF) deserves special mention within the category of oxidizing materials. The purpose of this handling sheet is to provide a quick reference to the proper handling and disposal of HF. **Caution:** This handout is not intended to replace the material safety data sheet (MSDS).

Physical Properties

The physical properties are listed below:

CAS #	7664-39-3
Formula	HF
Synonyms	Fluorohydric Acid
Molecular Weight	20.01
Appearance	Colorless, Fuming Liquid
Solubility	Miscible in Water
Density	48%, 1.150
Boiling Point	48%, 108 C
RCRA	U134
NIOSH:	Recommended Exposure Limit (REL), 8-hr TWA 3 ppm, 2.5 mg/m3
Odor Threshold	0.04 ppm

Shipping Description

Hydrofluoric Acid, Corrosive, Poison, 8, UN 1790

Health Hazards

- Fluoride ions readily penetrate skin and tissue, which may destroy subcutaneous tissue.
- Exposure to the vapors will cause respiratory damage.
- HF burns take a long time to heal and result in significant scarring.

Continued on next page

Chemical Handling Sheet - Hydrofluoric Acid Handling,
Continued

Handling Precautions

- Only persons fully trained in the hazards of HF should use it.
- HF is corrosive. Take all necessary precautions to prevent corrosion of equipment.
- Absorbent clothing can hold HF in contact with skin for extended periods of time.
- All HF work should be done in a properly functioning hood.
- All equipment that comes in contact with HF should be thoroughly washed with water immediately after use.
- HF should NEVER be used in glass containers.
- Contact with metals may cause the release of hydrogen gas, which is a fire or explosion hazard.

Personal Protection

Eye Protection: Transparent face shield. Acid-resistant plastic splash goggles (glass will become etched).
Gloves: Neoprene or rubber with long gauntlets.
Ventilation: Use in a hood with at least 100 feet per minute (fpm) face velocity.
Clothing: Rubber apron and rubber sleeve guards. Rubber boots are recommended because of the corrosive nature of HF to leather.

First Aid

HF burns are severe and are often not immediately noticed. First wash affected area with large amounts of water. Water will not penetrate as well as HF. Immediately seek medical treatment.
If hydrogen fluoride vapors have been inhaled, move the person immediately to an uncontaminated atmosphere (if it is safe to do so), keep the person warm, and seek prompt medical attention.

Storage and Disposal

- Store HF separately and keep only the amount necessary in the lab.
- Store in an HF-resistant container in a cool, dry location.
- Never store HF in a glass container because it is incompatible with glass.
- HF is a RCRA-listed waste in addition to being a characteristic corrosive waste.

Spill Remediation

Small HF spills should be neutralized with soda ash and washed with large amounts of water. Large spills of HF should also be neutralized with soda ash. An inert absorbent can be used to soak up the spilled material. The collected waste will need to be treated as hazardous waste.

Chemical Handling Sheet - Perchloric Acid

Purpose

Because of its hazards, perchloric acid deserves special mention within the category of oxidizing materials. The purpose of this handling sheet is to provide a quick reference to the proper handling and disposal of perchloric acid.

Caution: This handout is not intended to replace the material safety data sheet (MSDS).

Physical Properties

The physical properties of perchloric acid are listed below:

CAS #	7601-90-3
Formula	$HClO_4$
Appearance	Water white liquid fuming, oily liquid
Density	1.664, 70% solution
Boiling Point	203 C°
Odor	None

Shipping Description

Shipping description for perchloric acid is as follows:

Concentration	Description
>72%	Forbidden for transport
50-72%	Perchloric Acid, 5.1, Oxidizer, Corrosive UN1873
<50%	Perchloric Acid, 8, Corrosive, Oxidizer, UN1802

Health Hazards

- Fluoride ions readily penetrate skin and tissue, which may destroy subcutaneous tissue.
- Exposure to the vapors will cause respiratory damage.
- Perchloric acid burns take a long time to heal and result in significant scarring.

Continued on next page

Chemical Handling Sheet - Perchloric Acid, Continued

Handling Precautions

- A heated solution of perchloric acid is a very strong oxidizing agent. Solutions containing perchloric acid should be cooled wherever possible.
- Whenever possible, substitute a less hazardous chemical for perchloric acid.
- Do not allow perchloric acid to come in contact with any strong dehydrating agents, such as sulfuric acid. Accidental formation of anhydrous perchloric acid is possible through evaporation or dehydration of the acid. In this form **THE ACID IS EXPOSIVE!**
- *Do not* attempt to heat perchloric acid if you do not have access to a properly functioning perchloric acid fume hood. Perchloric acid can only be heated in a hood specially equipped with a washdown system to remove any perchloric acid residue. The hood should be washed down after each use and it is preferred to dedicate the hood to perchloric acid use only.
- Keep only the minimum amount necessary for your work.

Personal Protection

Eye Protection: Chemical-resistant splash goggles that are also impact-resistant
Gloves: Polyvinyl chloride (PVC).
Ventilation: Use in a hood with at least 100 feet per minute (fpm) face velocity. If process involves heating or fuming, a dedicated perchloric acid fume hood should be used.
Clothing: Lab coat. An apron is recommended if the perchloric acid used is in a concentrated form.
Respirator: May be required if large volumes are being used or if the perchloric acid has the potential to be volatilized. Use a National Institute of Occupational Safety and Health- (NIOSH-) approved respirator with an acid mist cartridge.

First Aid

Wash any exposed areas of skin with large volumes of water.
If eye contact has occurred, flush eyes in eye wash for 15 minutes. Seek medical treatment.

Continued on next page

Chemical Handling Sheet - Perchloric Acid, Continued

Storage and Disposal

- Perchloric acid should be stored in its original container within compatible secondary containment, preferably glass or porcelain. Glass trays should be wiped periodically.
- Perchloric acid should be kept separate from other chemicals, but may be stored with other inorganic acids, preferably in a metal cabinet designed for acid/corrosive storage.
- Small quantities of perchloric acid can be stored in a dedicated perchloric acid hood.
- No flammable materials or organic solvents should be used in the designated perchloric acid fume hood.
- Do not store perchloric acid with organic material
- Do not keep perchloric acid for more than a year, because explosive crystals may form.

Contact with Other Chemicals

Avoid contact of perchloric acid with the following chemicals:

- Sulfuric acid
- Phosphorous pentoxide
- Alcohol
- Glycerol
- Hypophosphites
- Acetic anhydride
- Bismuth and its alloys
- Combustible materials such as paper and wood.

Spill Remediation

CLEAN UP SPILLS OF PERCHLORIC ACID ONLY IF YOU HAVE BEEN TRAINED TO DO SO AND THE APPROPRIATE EQUIPMENT IS AVAILABLE!

To clean a spill, neutralize it with soda ash (sodium carbonate) or other appropriate neutralizing agent. Soak up the neutralized spill with an inorganic-based absorbent, if possible. Do not use organic materials, such as kim-wipes or toweling, because they may spontaneously ignite upon contact with perchloric acid. If rags or paper towels are inadvertently used, wet them with water and place them in a tightly sealed plastic bag. DO NOT use rags, paper towels, or sawdust and then put them aside to dry, because such materials may spontaneously ignite. A second neutralization and rinsing of the wetted area is recommended.

Perchloric acid waste must not be mixed with other wastes. It should be placed into acid-resistant containers that are clearly labeled and held for disposal.

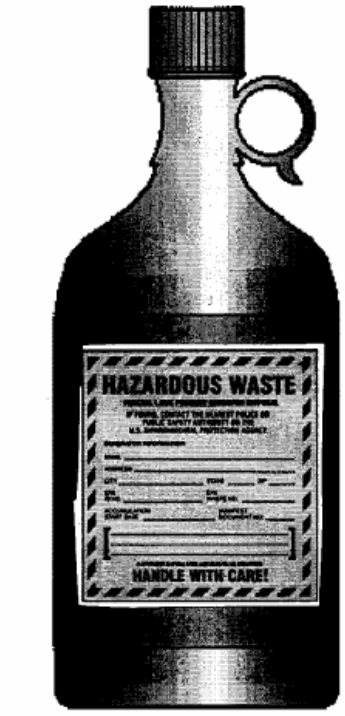
Appendix 6

Waste Handling Sheet – Acid Waste Solution Containing Metals

Process Generating Waste:	Waste acid generated during testing of fence for zinc content.
Pollution Prevention:	Do not dispose of acid waste solution with high metal content down any drain. Accumulate all acid wastes in a closed, marked container.
Safe Handling Tips:	Wear personal protective equipment that provides protection from corrosives. All concentrated acid wastes must be decanted in a fume hood.

ACCUMULATION IN LAB UNITS

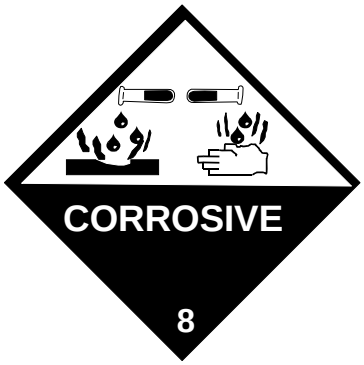
Accumulation Container



2 or 4-L Glass Container

Required Container Label

Complete the label with the words “Dangerous waste” and “Corrosive”



Handling Requirements

Responsibility	Individual lab personnel generating the waste
Onsite Accumulation Area	Acid waste solution should be stored under a fume hood or ventilated cabinet. Storage areas should be constructed of materials that are resistant to the acid waste. The storage cabinet should have vertical separations to provide for incompatible storage.

Continued on next page

Waste Handling Sheet – Acid Waste Solution Containing Metals, Continued

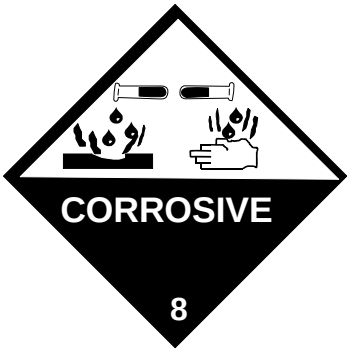
ACCUMULATION AT HAZARDOUS WASTE STORAGE UNIT

Accumulation Container

4-L Glass Container

Required Container Label

Complete the label with the words "Dangerous waste" and "Corrosive"



Handling Requirements

Responsibility	Chemical Hygiene Officer
Onsite Accumulation Area	Acid wastes storage cabinet in the Hazardous Waste Storage Unit
Managing the Container	Keep the container in good condition. Keep the lid closed. Keep the container secure and properly labeled.
Transport Preparation	When nearly full, call vendor for pickup and disposal
Paperwork/Documentation	Complete manifest. After pickup and disposal, confirm receipt of waste disposition (for example, certificate/documentation of disposal).

Waste Handling Sheet - Excel Clean HD Waste

Process Generating Waste:	Cleaning instruments and containers contaminated with asphalt.
Pollution Prevention:	Do not mix oil, lubricants, or other chemicals into the parts washing basin. Keep the basin lid closed when not in use. Let the cleaned parts dry before removing them from the drainage shelf. Prevent spills and releases from the system.
Safe Handling Tips:	Review the product label and the material safety data sheet (MSDS) for Excel Clean HD. Wear the personal protective equipment (PPE) specified by the label and MSDS when using the system and cleaning up any spilled material. PPE listed includes safety goggles and impervious gloves. Prevent fires by eliminating potential nearby sources of heat and ignition.

ACCUMULATION IN LAB UNITS

Accumulation Container	Required Container Label
 Five-gallon drum/pails or equivalent.	 Complete the label with the words “Dangerous waste” and “Toxic”

Handling Requirements

Responsibility	Individual lab personnel generating the waste
Onsite Accumulation Area	This waste is accumulated in the individual lab unit at designated waste accumulation area.
Managing the Container	Keep the washing basin container closed, dry, secure and in good condition. Make sure the container is correctly labeled. When the parts washing basin containing Excel Clean HD is spent and ready to be replaced, the entire basin is taken to the Hazardous Waste Storage Unit.

Continued on next page

Waste Handling Sheet – Acid Waste Solution Containing Metals, Continued

ACCUMULATION AT HAZARDOUS WASTE STORAGE UNIT

Accumulation Container	Required Container Label
 55-gallon drum or 35-gallon Poly Drum	 Complete the label with the words "Dangerous waste" and "Toxic"

Handling Requirements

Handling Responsibility	Chemical Hygiene Officer
Onsite Accumulation Area	Hazardous Waste Storage Unit
Managing the Container	Keep the container in good condition. Keep the lid closed. Keep the container secure and ensure it is properly labeled.
Transport Preparation	When nearly full, contact Waste Disposal Contractor.
Paperwork/Documentation	Complete and sign Uniform Hazardous Waste manifest. After pickup and disposal, confirm receipt of waste disposition (for example, certificate/documentation of disposal).

Waste Handling Sheet – Outdated Chemicals

Process Generating Waste:	Unused chemicals that are outdated or are no longer used.
Pollution Prevention:	Do not purchase more than necessary. Avoid transferring to separate container for use if at all possible, because this may increase the volume that would need to be purchased and disposed of. Always dispose according to appropriate methods. Prevent spills and releases from the system.
Safe Handling Tips:	Wear personal protective equipment that provides protection from the chemicals. Consult material safety data sheet (MSDS) as necessary.

ACCUMULATION IN LAB UNITS

Accumulation Container	Required Container Label
Leave in original container.	 Complete the label with the words “Dangerous waste” and appropriate hazard label according to class.

Handling Requirements

Responsibility	Individual lab personnel generating the waste.
Onsite Accumulation Area	An outdated chemical should be removed from the chemical storage cabinet as soon as it becomes outdated or unusable.

Continued on next page

Waste Handling Sheet – Acid Waste Solution Containing Metals, Continued

ACCUMULATION AT HAZARDOUS WASTE STORAGE AREA

Accumulation Container	Required Container Label
LAB PACK (Vary by Vendor)	 Complete the label with the words “Dangerous waste” and appropriate hazard label according to class

Handling Requirements

Handling Responsibility	Chemical Hygiene Officer
Onsite Accumulation Area	Hazardous Waste Storage Unit
Managing the Container	Keep the container in good condition. Keep the lid closed. Store only with compatible material.
. Paperwork/Documentation	After pickup and disposal, confirm receipt of waste disposition (for example, certificate/documentation of disposal).

Waste Handling Sheet – Partially Filled Chemical Product Containers

Process Generating Waste:	Aerosol paint cans, enamel, oil or latex-based paint in cans, or older materials still in their original containers used during facility and equipment management operations or by lab units.
Pollution Prevention:	Whenever possible, use all products until the containers are empty. Disposal of non-hazardous but usable products is wasteful and uneconomical. Partially filled containers that are discarded and still hold usable degreasers, solvents, or other chemicals may be considered Dangerous Wastes.
Safe Handling Tips:	Use gloves when handling partially filled containers. Ensure container lids are securely closed. Never store partially filled containers near extreme heat sources or in the sun. Containers that are empty should be handled in accordance with the Waste Handling Sheet "Empty Metal, Plastic, or Glass Containers."

ACCUMULATION IN LAB UNITS OR MAINTENANCE SHOP

Accumulation Container	Required Container Label
 *Black plastic bags*	 *or*  Specific product MSDSs are required to select the container and complete the container label. If the contents are hazardous wastes, they must be placed in steel drums and the yellow label must be used.

Handling Requirements

Responsibility	Individual lab personnel generating the waste or Facilities and Equipment Management Operations personnel generating the waste.
Satellite Accumulation Area	In the designated area in each lab unit or Maintenance Shop.

Continued on next page

Waste Handling Sheet – Partially Filled Chemical Product Containers, Continued

ACCUMULATION AT HAZARDOUS WASTE STORAGE AREA

Accumulation Container	Required Container Label
 55-gallon drums	 *or*  ***Specific product MSDSs are required to select the container and complete the container label. If the contents are hazardous wastes, they must be placed in steel drums and the yellow label must be used.***

Handling Requirements

Handling Responsibility	Chemical Hygiene Officer if it is hazardous waste.
Onsite Accumulation Area	Hazardous Waste Storage Unit if it is hazardous waste. If it is a non-hazardous waste, dispose as solid waste.
Managing the Container	Keep the container in good condition. Keep the lid closed. Store only with compatible material.
Transport Preparation	When nearly full, call vendor for pickup and disposal.
Paperwork/Documentation	After pickup and disposal, confirm receipt of waste disposition (for example, certificate/documentation of disposal).

Waste Handling Sheet – Solvent Waste

Process Generating Waste:	Solvent waste generated during sample testing.
Safe Handling Tips:	Review the product label and the material safety data sheet (MSDS) for the solvent. Wear the personal protective equipment specified by the label and MSDS. Transfer of solvent waste should take place in a fume hood. Prevent fires by eliminating potential nearby sources of heat and ignition.

ACCUMULATION IN LAB UNITS

Accumulation Container

2 or 4-L Container

Required Container Label

Complete the label with the words “Dangerous waste” and “Flammable”

Handling Requirements

Responsibility	Individual lab personnel generating the waste.
Onsite Accumulation Area	This waste is accumulated in the designated waste accumulation area, which is well-ventilated, or in a flammable liquid storage cabinet. Should be stored away from acids.

Continued on next page

Waste Handling Sheet – Solvent Waste, Continued

ACCUMULATION AT HAZARDOUS WASTE STORAGE UNIT

Accumulation Container

4-L Container

Required Container Label

Complete the label with the words “Dangerous waste” and “Flammable”

Handling Requirements

Handling Responsibility	Chemical Hygiene Officer
Onsite Accumulation Area	Flammable storage cabinet in the Hazardous Waste Storage Unit
Managing the Container	Keep the container in good condition. Keep the lid closed. Keep the container secure and ensure it is properly labeled.
Transport Preparation	When nearly full, call vendor for pickup and disposal.
Paperwork/Documentation	Complete manifest. After pickup and disposal, confirm receipt of waste disposition (for example, certificate/documentation of disposal).

Appendix 7

EMERGENCY ACTION PLAN

General Emergency Procedures

The Chemical Hygiene Officer is responsible for obtaining and maintaining the appropriate emergency response telephone numbers and posting the telephone numbers in the laboratory.

The essence of a plan to handle emergencies is summarized in the acronym "NEAR": Notify, Evacuate, Assemble, and Report.

Notification:

The person involved in or witnessing the accident or emergency must notify the section supervisor, the Chemical Hygiene Officer, or the Emergency Coordinator indicated on the personnel directory for the following emergencies:

- All spills
- Injuries

The fire department/EMS shall be notified for the following emergencies:

- Spills that cannot be handled by lab spill kits or cannot be cleaned up without a significant employee skin or inhalation exposure to dangerous amounts of hazardous chemicals.
- All fires
- All explosions
- Serious injuries/Medical Emergencies

The local fire department or a qualified hazardous chemical spill cleanup contractor will handle all major spills, fires, or explosions. No Materials Lab employee will attempt cleanup of a major chemical spill. A "major chemical spill" is defined as a spill that cannot be handled by lab spill kits or cannot be cleaned up without significant employee skin or inhalation exposure to dangerous amounts of hazardous chemicals (see also Section 4.3). All laboratory employees will be evacuated from the spill, fire, or explosion area during cleanup or other emergency activities and will not re-enter until given clearance by the fire department or cleanup contractor.

Evacuate

The decision to evacuate will be made by the person who is notified, the section supervisor, Chemical Hygiene Officer, or Emergency Coordinator. If evacuation is necessary, or if the fire alarm sounds, the Evacuation Plan (following this section) will be followed beginning with notification of the Emergency Coordinator or an alternate. Do not re-enter the evacuated area until instructed to do so by the Emergency Coordinator.

The lab is equipped with an audible fire alarm system that can be activated manually or by smoke sensors in various locations in the lab. The manual pull-box alarm locations are located throughout the lab.

Assemble

Employees are to assemble at the areas designated in the evacuation plan following an evacuation. Section supervisors, the Chemical Hygiene Officer, and the emergency coordinator are responsible to determine if all employees have assembled at the assembly area. If an

employee has not evacuated, that information will be given to the fire or police department when they respond to the incident. Under no circumstances are employees to re-enter the laboratory after an evacuation until approval is given by the fire department or Emergency Coordinator if the fire department is not summoned.

Reporting

All incidents must be reported through the Incident Report Form (following this section).

The Chemical Spill Form (following this section) may also be used to report spills.

Medical Emergencies

In an emergency requiring immediate critical first aid, follow these steps:

1. Notify one of the qualified emergency first aid responders.
2. Call for an ambulance or paramedics (911).
3. Act in a way that will prevent further injury. Do not move the victim(s) unless there is a risk of further injury in his or her current location. Do not endanger yourself or others while trying to assist the victim(s).
4. Any employee who renders first aid and is exposed to blood will be offered hepatitis vaccinations as required by the OSHA Bloodborne Pathogens regulations - 29 CFR 1910.1030.

In case of a minor accident or injury requiring medical attention, the employee will be taken to the local medical provider. In case of serious injury, the employee will be transported to the emergency room by ambulance. Maps showing routes to the local medical provider and emergency telephone numbers can be found in the break rooms and in this Appendix.

First Aid Kits

First aid kits are located throughout the lab.

Chemical Spill Report

Report filed by:

Date:

Section I: Spill

A) Date of Spill:

Time: (AM/PM) circle one

B) Name of chemical (s) Amount Units (pounds, grams, etc.)

Attach a copy of the MSDS sheets for all chemicals listed.

C) Location of Spill

D) Describe exactly where the spill occurred; be as specific and as exact as possible. If the spill happened within the laboratory, locate the spill with a large black X on the map attached to this form.

E) List everyone in the immediate area when the spill occurred.

NAME MATS LAB EMPLOYEE (Y/N)

F) Describe how the spill happened.

G) Was the area evacuated? ( ) Yes ( ) No

H) Symptoms (if any) person(s) experiencing?

Name Symptom(s)

I) Was first aid given? ( ) Yes( ) No

J) Describe any first aid given or any immediate action taken. (e.g. safety shower, eye wash, etc.)

K) Was a physician consulted? ( ) Yes( ) No

L) Was it a medical emergency? ( ) Yes( ) No

Section II: Clean Up

A.) How was this spill cleaned up? Who was involved in the spill clean-up? If the spill clean-up kit was used, give its name, manufacturer, catalog number, and the location it was taken from.

B.) Disposal
Describe how the waste (the spilled chemical and the clean-up residue) was disposed of.

Section III Misc.

A.) Unsafe condition or act causing spill:

B.) Action taken to prevent similar spills:

C.) Additional Comments, Recommendations, or Actions:

_____

Signature Date

_____

Chemical Hygiene Officer Signature Date

_____

Laboratory Manager Signature Date

Route copies to
a.) Safety and Health Services Office
b.) Chemical Hygiene Officer
c.) Lab Administrative Officer

Incident Reporting Form

Incident #

*****REPORT MUST BE COMPLETED WITHIN 24 HOURS FOLLOWING INCIDENT*****

Employee Name: *Job Title:*

Last, First, MI

Date of Incident: *Time of Incident:* ☐ *AM* ☐ *PM*

Month, Day, Year

Name of Supervisor: *Lab Section:*

Last, First, MI

Incident Location: *Weather Conditions:*

STATEMENTS

Employee's Account of Incident:

Specific Material and Location:

The above statement is true and accurate.

Employee's Signature: *Date:*

Witness Statement:

The above statement is true and accurate.

Witness's Signature: *Date:*

Witness Statement:

The above statement is true and accurate.

Witness's Signature: Date:

Supervisor's Signature: Date:

Manager's Signature: Date:

EVACUATION PLAN

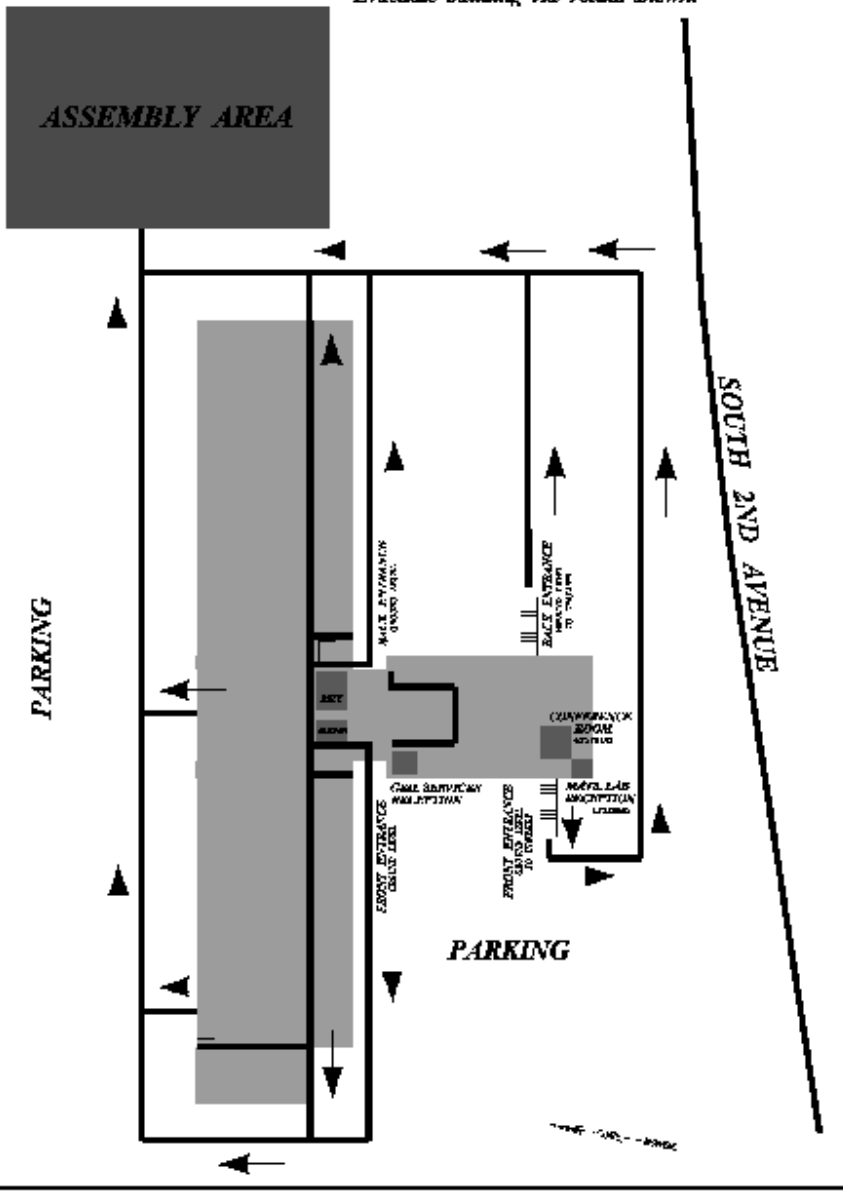
In the event of an emergency requiring evacuation, the following procedures must be followed:

1. At the sound of a fire alarm, or if instructed, all personnel must evacuate. Maps outlining evacuation routes are located throughout the lab and are attached to this appendix. Follow lighted exit paths to building exits. All employees are to assemble at the staging area, which is indicated in the evacuation plan.
2. Do not panic - remain calm.
3. Listen for instructions. The Emergency Coordinator will repeat instructions throughout the course of the evacuation.
4. All employees must assemble at the evacuation staging area. If instructed to do so by your Emergency Coordinator(s), you may need to move upwind or to an alternate area. Only the Emergency Coordinator has authority to move a group to an alternate staging area.
5. Supervisors are responsible for accounting for all employees in their groups or any visitor who has entered the facility. The receptionists in the lab and in the main building are in charge of the visitor log-in books. These log-in books will be brought to the check-in station during evacuation procedures so that all visitors can be accounted for.
6. All employees must remain at the evacuation staging area until instructed to return by the Emergency Coordinator.
7. During evacuation procedures, never leave the staging area unless instructed to do so by the Emergency Coordinator.

MATERIALS LAB /
GEOGRAPHIC SERVICES BUILDING

EVACUATION ROUTES

Evacuate building via routes shown:



Appendix 8

Hazard Assessment for Personal Protective Equipment

Use with WAC 296-800-160 Personal Protective Equipment (PPE)

This tool can help you do a hazard assessment to see if your employees need to use personal protective equipment (PPE) by identifying activities that may create hazards for your employees. The activities are grouped according to what part of the body might need PPE. You can make copies, modify and customize the form to fit the specific needs of your particular work place, or develop your own form that is appropriate to your work environment.

This tool can also serve as written certification that you have done a hazard assessment as required by WAC 296-800-16010. Document your hazard assessment for PPE. Make sure that the blank fields at the beginning of the checklist (indicated by *) are filled out (see below, Instruction #4).

Instructions:

- Do a walk-through survey of each work area and job/task. Read through the list of work activities in the first column, putting a check next to the activities performed in that work area or job.
- Read through the list of hazards in the second column, putting a check next to the hazards to which employees may be exposed while performing the work activities or while present in the work area. (for example, abrasive blasting: chopping wood; work-related exposure: flying particles).
- Decide how you are going to control the hazards. Try considering engineering, work place, and/or administrative controls to eliminate or reduce the hazards before resorting to using PPE. If the hazard cannot be eliminated without using PPE, indicate which type(s) of PPE will be required to protect your employee from the hazard.
- Make sure that you complete the following fields on the form (indicated by *) to certify that a hazard assessment was done:
  - Name of your work place
  - Address of the work place where you are doing the hazard assessment
  - Name of person certifying that a workplace hazard assessment was done
  - Date the hazard assessment was done

PPE HAZARD ASSESSMENT CERTIFICATION FORM

*NAME OF WORK PLACE: _____ *ASSESSMENT CONDUCTED BY: _____

*WORK PLACE ADDRESS: _____ *DATE OF ASSESSMENT: _____

WORK AREA(S): _____ JOB/TASK(S): _____

*REQUIRED FOR CERTIFYING THE HAZARD ASSESSMENT. USE A SEPARATE SHEET FOR EACH JOB/TASK OR WORK AREA

EYES

WORK ACTIVITIES, SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ ABRASIVE BLASTING ☐ CHOPPING ☐ CUTTING ☐ DRILLING ☐ WELDING ☐ PUNCH PRESS OPERATIONS ☐ OTHER: ____ ☐ SANDING ☐ SAWING ☐ GRINDING ☐ HAMMERING	☐ AIRBORNE DUST ☐ FLYING PARTICLES ☐ BLOOD SPLASHES ☐ HAZARDOUS LIQUID CHEMICALS ☐ INTENSE LIGHT ☐ OTHER: ____	YES ☐ NO ☐ IF NO, USE: ☐ SAFETY GLASSES ☐ SAFETY GOGGLES GOGGLES ☐ SHADING/FILTER (#____) ☐ WELDING SHIELD ☐ OTHER: ____ ☐ SIDE SHIELDS ☐ DUST-TIGHT

FACE

WORK ACTIVITIES, SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ CLEANING WORK ☐ WELDING ☐ SIPHONING ☐ PAINTING MOLTEN ☐ OTHER ____ ☐ FOUNDRY ☐ MIXING ☐ POURING METAL	☐ HAZARDOUS LIQUID CHEMICALS ☐ EXTREME HEAT/COLD ☐ POTENTIAL IRRITANTS: ____ ☐ OTHER: ____	YES ☐ NO ☐ IF NO, USE: ☐ FACE SHIELD ☐ SHADING/FILTER (#____) ☐ WELDING SHIELD ☐ OTHER: ____

HEAD

WORK ACTIVITIES, SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ BUILDING MAINTENANCE ☐ CONFINED SPACE OPERATIONS ☐ CONSTRUCTION ☐ ELECTRICAL WIRING ☐ WALKING/WORKING UNDER CATWALKS ☐ WALKING/WORKING UNDER CONVEYOR BELTS ☐ WALKING/WORKING UNDER CRANE LOADS ☐ UTILITY WORK ☐ OTHER: ____	☐ BEAMS ☐ PIPES ☐ EXPOSED ELECTRICAL WIRING OR COMPONENTS ☐ FALLING OBJECTS ☐ MACHINE PARTS ☐ OTHER: ____	YES ☐ NO ☐ IF NO, USE: ☐ PROTECTIVE HELMET ☐ TYPE A (LOW VOLTAGE) ☐ TYPE B (HIGH VOLTAGE) ☐ TYPE C ☐ BUMP CAP (NOT ANSI-APPROVED) ☐ HAIR NET OR SOFT CAP ☐ OTHER: ____

HANDS/ARMS

WORK ACTIVITIES, SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ USING COMPUTERS ☐ MATERIAL HANDLING ☐ GRINDING ☐ WELDING ☐ USING KNIVES ☐ SANDING ☐ SAWING ☐ HAMMERING	☐ BLOOD ☐ HAZARDOUS CHEMICALS CHEMICAL: _____ CHEMICAL: _____	YES ☐ NO ☐ IF NO, USE: ☐ GLOVES ☐ CHEMICAL RESISTANCE

☐ WORKING WITH GLASS ☐ OTHER: ____	CHEMICAL: _____ CHEMICAL: _____ CHEMICAL: _____ ☐ TOOLS OR MATERIALS THAT COULD SCRAPE, BRUISE, OR CUT ☐ EXTREME HEAT/COLD ☐ OTHER: ____	☐ LIQUID/LEAK RESISTANCE ☐ TEMPERATURE RESISTANCE ☐ ABRASION/CUT RESISTANCE ☐ SLIP RESISTANCE ☐ PROTECTIVE SLEEVES ☐ OTHER: ____

FEET/LEGS

WORK ACTIVITIES, SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ BUILDING MAINTENANCE ☐ CONSTRUCTION ☐ DEMOLITION ☐ PLUMBING ☐ TRENCHING ☐ USE OF HIGHLY FLAMMABLE MATERIALS ☐ WELDING ☐ OTHER: ____	☐ EXPLOSIVE ATMOSPHERES ☐ EXPLOSIVES ☐ EXPOSED ELECTRICAL WIRING OR COMPONENTS ☐ HEAVY EQUIPMENT ☐ SLIPPERY SURFACES ☐ TOOLS ☐ OTHER: ____	YES ☐ NO ☐ IF NO, USE: ☐ safety shoes or boots ☐ TOE PROTECTION ☐ METATARSAL PROTECTION ☐ ELECTRICAL PROTECTION ☐ HEAT/COLD PROTECTION ☐ PUNCTURE RESISTANCE ☐ CHEMICAL RESISTANCE ☐ ANTI-SLIP SOLES ☐ LEGGINGS OR CHAPS ☐ FOOT-LEG GUARDS ☐ OTHER: ____

BODY/SKIN

WORK ACTIVITIES SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ BATTERY CHARGING ☐ DIP TANK OPERATIONS ☐ FIBERGLASS INSTALLATION ☐ IRRITATING CHEMICALS ☐ SAWING ☐ OTHER: ____	☐ CHEMICAL SPLASHES ☐ EXTREME HEAT/COLD ☐ SHARP OR ROUGH EDGES ☐ OTHER: ____	YES ☐ NO ☐ IF NO, USE: ☐ VEST, JACKET ☐ COVERALLS, BODY SUIT ☐ RAINGEAR ☐ APRON ☐ WELDING LEATHERS ☐ ABRASION/CUT RESISTANCE ☐ OTHER: ____

LUNGS/RESPIRATORY [1]

WORK ACTIVITIES SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ CLEANING ☐ POURING ☐ MIXING ☐ SAWING ☐ PAINTING ☐ FIBERGLASS INSTALLATION ☐ COMPRESSED AIR OR GAS OPERATIONS ☐ OTHER: ____	☐ IRRITATING DUST OR PARTICULATE ☐ IRRITATING OR TOXIC GAS/VAPOR ☐ OTHER: ____	YES ☐ NO ☐ *(SEE FOOTNOTE 1)

EARS/HEARING [1]

WORK ACTIVITIES SUCH AS:	WORK-RELATED EXPOSURE TO:	CAN HAZARD BE ELIMINATED WITHOUT THE USE OF PPE?
☐ GENERATOR ☐	☐ LOUD NOISES	YES ☐ NO ☐

GRINDING ☐ VENTILATION FANS ☐ MACHINING ☐ MOTORS ☐ ROUTERS ☐ SANDING ☐ SAWING ☐ PNEUMATIC EQUIPMENT ☐ PUNCH OR BRAKE PRESSES ☐ USE OF CONVEYORS ☐ OTHER: ____	☐ LOUD WORK ENVIRONMENT ☐ NOISY MACHINES/TOOLS ☐ PUNCH OR BRAKE PRESSES ☐ OTHER: ____	*(SEE FOOTNOTE 1)

(1) NOTE: Other hazards requiring PPE (such as respiratory, noise, fall, etc.) are not included in this volume of the PPE Guide but will be covered in future volumes (see WAC 296-62 for respiratory and hearing protection and WAC 296-155 for fall protection for further assessment). However, you should consider all hazards when you conduct your hazard assessment. See a list of other Washington Industrial Safety and Health Administration rules (in “How to use this guide,” p. 4) for information regarding PPE for specific work places.

Appendix 9

Sample MSDS

MSDS for ACETONE Page 1

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1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ACETONE
FORMULA: (CH3)2CO
FORMULA WT: 58.08
CAS NO.: 67-64-1
NIOSH/RTECS NO.: AL3150000
COMMON SYNONYMS: DIMETHYL KETONE; METHYL KETONE; 2-PROPANONE
PRODUCT CODES: 9010,9006,9002,9254,9009,9001,9004,5356,A134,9007,9005,9005,9008
EFFECTIVE: 08/27/86
REVISION #02
PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM:
HEALTH - 1 SLIGHT
FLAMMABILITY - 3 SEVERE (FLAMMABLE)
REACTIVITY - 2 MODERATE
CONTACT - 1 SLIGHT
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

DANGER
CAUSES IRRITATION
EXTREMELY FLAMMABLE
HARMFUL IF SWALLOWED OR INHALED
KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING.
AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE.
FLUSH SPILL AREA WITH WATER SPRAY.
SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

2 - HAZARDOUS COMPONENTS

COMPONENT % CAS NO.
ACETONE 90-100 67-64-1

3 - PHYSICAL DATA

BOILING POINT: 56 C (133 F) VAPOR PRESSURE(MM HG): 181

MELTING POINT: -95 C (-139 F) VAPOR DENSITY(AIR=1): 2.0
SPECIFIC GRAVITY: 0.79 EVAPORATION RATE: ~10
(H2O=1) (BUTYL ACETATE=1)
SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100
APPEARANCE & ODOR: CLEAR, COLORLESS LIQUID WITH A FRAGRANT SWEET ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: -18 C (0 F) NFPA 704M RATING: 1-3-0
FLAMMABLE LIMITS: UPPER - 13.0 % LOWER - 2.6 %
FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)
SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND
SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE
PRESSURE MODE.
MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.
UNUSUAL FIRE & EXPLOSION HAZARDS
VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK.
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 1780 MG/M3 (750 PPM)
SHORT-TERM EXPOSURE LIMIT (STEL): 2375 MG/M3 (1000 PPM)
PERMISSIBLE EXPOSURE LIMIT (PEL): 2400 MG/M3 (1000 PPM)
TOXICITY: LD50 (ORAL-RAT) (MG/KG) - 9750
LD50 (ORAL-MOUSE) (MG/KG) - 3000
LD50 (IPR-MOUSE) (MG/KG) - 1297
LD50 (SKN-RABBIT) (G/KG) - 20
CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO
EFFECTS OF OVEREXPOSURE
VAPORS MAY BE IRRITATING TO SKIN, EYES, NOSE AND THROAT.
INHALATION OF VAPORS MAY CAUSE NAUSEA, VOMITING, HEADACHE, OR LOSS OF CONSCIOUSNESS.
LIQUID MAY CAUSE PERMANENT EYE DAMAGE.
CONTACT WITH SKIN HAS A DEFATTING EFFECT, CAUSING DRYING AND IRRITATION.

INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTROINTESTINAL IRRITATION.
CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.
TARGET ORGANS: RESPIRATORY SYSTEM, SKIN
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: NONE IDENTIFIED
ROUTES OF ENTRY: INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT
EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

6 - REACTIVITY DATA

STABILITY: STABLE
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR
CONDITIONS TO AVOID: HEAT, FLAME, SOURCES OF IGNITION
INCOMPATIBLES: HALOGEN ACIDS AND HALOGEN COMPOUNDS, STRONG BASES, STRONG OXIDIZING AGENTS, CAUSTICS, AMINES AND AMMONIA,
CHLORINE AND CHLORINE COMPOUNDS, STRONG ACIDS, ESP. SULFURIC, NITRIC, HYDROCHLORIC

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SUITABLE PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.
J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.
DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.
EPA HAZARDOUS WASTE NUMBER: U002 (TOXIC WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP
TO 5000 PPM, A GAS MASK WITH ORGANIC VAPOR
CANNISTER IS RECOMMENDED. ABOVE THIS LEVEL, A
SELF-CONTAINED BREATHING APPARATUS WITH FULL FACE
SHIELD IS ADVISED.
EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, BUTYL RUBBER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)
SPECIAL PRECAUTIONS
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)
PROPER SHIPPING NAME: ACETONE
HAZARD CLASS: FLAMMABLE LIQUID
UN/NA : UN1090
LABELS: FLAMMABLE LIQUID
REPORTABLE QUANTITY : 5000 LBS.
INTERNATIONAL (I.M.O.) PROPER SHIPPING NAME: ACETONE
HAZARD CLASS : 3.1
UN/NA : UN1090
LABELS : FLAMMABLE LIQUID

Appendix 10

Link to WSDOT Form

Washington State Department of Transportation

Employee Report of Accident

[1] Employee Name (Last, First, MI)	[2] SSN	[3] Region	[4] Date of Report
[5] Major Organization (Check One) ☐ Admin. ☐ Engineering ☐ Maint. ☐ WSF	[6] Org Code	[7] Sex ☐ Male ☐ Female	[8] Date of Birth
[9] Job Title	[10] Job Class Number		[11] Shift
[12] Supervisor's Name (Last, First, MI)	[13] Supervisor's Phone		

[14] Date and Time of Accident	[16] Type Accident (Check all that apply) ☐ Fatality ☐ Involving State Vehicle ☐ Near Miss ☐ Injury ☐ Involving Marine Vessel ☐ Illness ☐ Property/Equipment
[15] Date and Time Reported to Supervisor	

[17] General Activity	[18] Specific Activity	[19] Location
[20] General Location	[21] Specific Location	[22] ☐ Off Premises

[23] Description of the accident:

[24] Describe how you tried to avoid the accident:

[25] Describe what would have helped to prevent the accident:

[26] Nature of Injury/Illness	[27] Body Part Involved	[28] Side of Body ☐ Left ☐ Right
[29] Source of Injury	[30] Cause of Injury	

[31] Medical Treatment Req. ☐ Yes ☐ No	[32] Medical Treatment ☐ First Aid Only ☐ Treated via Outpatient Care ☐ Treated at Clinic ☐ Hospitalized ☐ Treated at Emerg. Room	[33] Time Depart for Treatment
		[34] Time Returned

[35] Last Day Worked	[36] Are you unable to work? ☐ Yes ☐ No	[37] Estimated Date of Return to Work

Complete this section if any type of vehicle was involved

[38] Type of Vehicle(s) Involved ☐ State-Owned Vehicle ☐ POV Driven on State Business ☐ Other non-state Owned Vehicle

[39] Make of Vehicle	[40] Body Type	[41] Model	[42] Year	[43] License No.	[44] Equip. No. (If State-Owned)

[45] Were Other Vehicles Involved? ☐ Yes ☐ No If "Yes", Complete and attach SF Form 137	[46] Type Road Surface	[47] Road Condition	[48] Weather Condition

[49] Check All Warning Devices in Use ☐ Rotating Flashers ☐ Arrow Board ☐ TMA ☐ None

[50] What, in your opinion, caused the accident?

Employee Signature _____ Date _____

DOT Form 750-010 EF
Revised 5/03

Link to WSDOT Form

Supervisor's Report of Investigation

This Section to be Completed by Injured Employee's First Line Supervisor

[51] Investigator's Name (Last, First, MI)	[52] Title	[53] Org Code	[54] Supervisor's Phone

[55] Date Investigation Began	[56] Date Completed	[59] Employee's Current Work Status
		☐ Lost Time Date Started _____
[57] Is Modified Duty Available? ☐ Yes ☐ No	[58] Modified Duty Avail. Until	☐ Modified Duty Date Started _____
		☐ Full Duty Date Started _____

[60] Frequency Potential	[61] Severity Potential
☐ Frequent ☐ Occasional ☐ Rare	☐ Major ☐ Serious ☐ Minor

[62] Investigation Summary

[63] List Personal Protective Equipment (PPE) available to employee

[64] Was PPE Equipment Used?	[65] If "No', Explain
☐ Yes ☐ No	

[66] List PPE Equipment Used at the Time of the Accident

[67] Time Shift Began	[68] Time Shift Ended	[69] Years Experience in this Job	[70] Years Exp. Doing this Task

[71] Was Employee Trained for this Task?	[72] Date Last Trained on Task	[73] How was Employee Trained?
☐ Yes ☐ No		

[74] **Substandard Actions**	[75] **Substandard Conditions**
☐ 1. Operating Equipment without Authority	☐ 1. Inadequate Guards or Barriers
☐ 2. Failure to Warn	☐ 2. Inadequate or Improper Protective Equipment
☐ 3. Failure to Secure	☐ 3. Defective Tools, Equipment, or Materials
☐ 4. Operating at Improper Speed	☐ 4. Congestion or Restricted Action
☐ 5. Making Safety Devices Inoperative	☐ 5. Inadequate Warning Systems
☐ 6. Removing Safety Devices	☐ 6. Fire and/or Explosion Hazard
☐ 7. Using Defective Equipment	☐ 7. Poor Housekeeping; Disorder
☐ 8. Using Equipment Improperly	☐ 8. Hazardous Env. Conditions (Gas, Smoke, Dust, etc.)
☐ 9. Failure to Use PPE Properly	☐ 9. Noise Exposure
☐ 10. Improper Loading	☐ 10. Radiation Exposure
☐ 11. Improper Placement	☐ 11. High or Low Temperature Exposure
☐ 12. Improper Lifting	☐ 12. Inadequate or Excessive Illumination
☐ 13. Improper Position for Task	☐ 13. Inadequate Ventilation
☐ 14. Servicing Equipment in Operation	☐ 14. _____
☐ 15. Horseplay	☐ 15. _____
☐ 16. Under the Influence of Drugs/Alcohol	☐ 16. _____
☐ 17. None	

[76] Immediate Cause: ☐ Human Error ☐ Condition Defect

[77] **Underlying Causes:** (Place a **[P]**rimary **[S]**econdary for each applicable cause)

☐ 1. Design Issue	☐ 6. Training Issue	☐ 11. Medical Issue
☐ 2. Construction Issue	☐ 7. Personnel Issue	☐ 12. Security Issue
☐ 3. Maintenance Issue	☐ 8. Finance/Budget Issue	☐ 13. Problem re: WSDOT operations
☐ 4. Operating Issue	☐ 9. Purchasing Issue	☐ 14. Fair Wear and Tear
☐ 5. Supervision Issue	☐ 10. Employee Relations/Legal Issue	☐ 15. Abuse/Misuse Issue

Link to WSDOT Form

Supervisor's Report of Investigation - Continued

[78] Additional Issues

[79] Explain Items Checked

[80] Corrective Action Plan - Changes taken or planned to eliminate the basic and underlying cause(s)

[81] Date Corrective Action(s) Completed

Cost of Accident

[82] Equipment Repair Costs	$	[85] Damaged Goods	$
[83] New Equipment Costs	$	[86] Other Property Costs	$
[84] Estimated Other Costs	$	[87] **Total Costs**	**$**

Investigator's Signature _____ Date _____

Reviewer Section

[88] Date Report Received for Review	[89] Reviewer Name (Last, First, MI)	[90] Reviewer Phone
[91] Reviewer Title		[92] Org Code

[93] Reviewer's reaction to the investigator's analysis of the basic causes of the accident and the corrective action plan directed at possible inadequacies on the program, its standards or compliance to the standards.

Reviewer's Signature _____ Date _____

Appendix 11

Bulk Hazardous Material and Waste Storage Areas Inspection Log – Bi-weekly

Instructions: Make copies of this form as they are needed. Inspect bulk hazardous material and waste storage areas once a week for leaks, signs of corrosion, dents, bulging, swelling, and proper labeling. If a container is found to be leaking, immediately transfer the waste to a new container. Containers must be closed at all times except when adding or removing wastes. Waste containers must not be stored next to other containers holding incompatible chemicals (that is, acids and bases, flammables and oxidizers, cyanides and acids, etc.) unless they are separated by a cabinet wall or have secondary containment (plastic pail). Document every inspection on this form and save every inspection log for at least 3 years. Make sure that any deficiencies you find are corrected immediately and are documented in writing.

Hazardous Material/Hazardous Waste Storage Area (Circle One)
Room Number/Area: _____

Inspector: _____ Phone Number: _____

Date	Inspector's Initials	Storage area free of spills and leaks	Containers and storage area properly labeled	Containers within secondary containment	Fire extinguishers serviced and tagged	Hazardous waste labels complete and visible	Eye wash, safety showers, ER equipment function	Containers sealed with tight-fitting lids/bungs	Incompatibles properly separated	Waste not stored over allowable time	Comment/Corrective Action
		Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	

Satellite Hazardous Material and Waste Storage Areas Inspection Log - Quarterly

Instructions: Make copies of this form as they are needed. Inspect waste containers holding hazardous chemical wastes once a week for leaks, signs of corrosion, dents, bulging, swelling, and proper labeling. If a container is found to be leaking, immediately transfer the waste to a new container. Containers must be closed at all times except when adding or removing wastes. Waste containers must not be stored next to other containers holding incompatible chemicals (that is, acids and bases, flammables and oxidizers, cyanides and acids, etc.) unless they are separated by a cabinet wall or have secondary containment (plastic pail). Document every inspection on this form and save every inspection log for at least 3 years. For the Satellite Hazardous Waste Storage areas, up to 55 gallons of one waste stream can be stored at a given location. Make sure that any deficiencies you find are corrected immediately and are documented in writing.

Lab Unit: _____ Room Number/Area: _____

Section Supervisor: _____ Phone Number: _____

Date	Inspector's Initials	Storage area free of spills and leaks	Containers and storage area properly labeled	Containers Closed	Containers properly segregated	Hazardous waste labels complete and visible	Waste not stored over allowable time	Comment/Corrective Action
		Y/N	Y/N	Y/N	Y/N	Y/N/NA	Y/N/NA	

*NA – Not applicable

Laboratory Safety Equipment Checklist - Quarterly

Laboratory Unit_____ Date_____

Inspector Name_____ Room Number/Area_____

Emergency Equipment:

	Number	**Open**		**Comments**				
Fire Doors		Yes	No					
	Number	**Accessible**		**Adequate Flow (If testable)**		**Comments**		
Safety Shower		Yes	No	Yes	No			
Eye Wash Units		Yes	No	Yes	No			
	Number	**Accessible**		**Adequately Stocked**		**Comments**		
First Aid Kits		Yes	No	Yes	No			
Spill Kits		Yes	No	Yes	No			
	Number	**Accessible**		**Pin In Place**		**Gauge Full (If present)**		**Comments/ Damage**
Fire Extinguishers		Yes	No	Yes	No	Yes	No	

Fume hoods:

Functioning Properly? □Yes □No □ Not Applicable (If no, has it been reported? □Yes □No)

Has the fume hood been inspected in the past year? □Yes □No □ Not Applicable

Is fume hood being improperly used for storage and disposal? □Yes □No □ Not Applicable

Miscellaneous:

Personal Protective Equipment available? □Yes □No Currently In use? □Yes □No

Are gas cylinders in use? □Yes □No Secured? □Yes □No

Chemical inventory updated in the past year and a copy sent to department? □Yes □No □Not Applicable

Date of last chemical inventory update: _____

Are training records up-to-date? □Yes □No Date of last update:_____

Chemicals properly stored (segregated according to chemical class)? □Yes □No □ Not Applicable

Is chemical waste being labeled and disposed of properly? □Yes □No □ Not Applicable

Are all containers and bottles properly labeled? □Yes □No □ Not Applicable

Evidence of food or drink in the laboratory? □Yes □No

Are all belts/pulleys properly guarded? □Yes □No □ Not Applicable

Weekly laboratory inspection forms completed? □Yes □No □ Not Applicable

Comments:_____

_____

_____

Laboratory Safety Inspection Checklist - Annual

Laboratory Unit_____ Date_____

Inspector Name_____ Room Number/Area_____

I. Laboratory Work Practices

	Yes/No	*Comments*
✓ No smoking, food and beverages rules are observed. ✓ Food and beverages are not stored in the laboratory areas, refrigerators, or in glassware that is also used for laboratory operations.	Yes/No	
✓ Pipetting is performed by mechanical means.	Yes/No	
✓ Laboratory surfaces are cleaned, disinfected, or decontaminated after work is performed.	Yes/No	
✓ Required PPE is being worn.	Yes/No	
✓ Hoods are not being used for storage.	Yes/No	

II. Housekeeping

	Yes/No	**Comments**
✓ Laboratory and storage areas uncluttered and orderly (including bench top).	Yes/No	
✓ Aisles and exits are free from obstruction.	Yes/No	
✓ Work surfaces are protected from contamination.	Yes/No	
✓ Electrical cords are in good condition and are UL-listed.	Yes/No	
✓ Tools and equipment are in good repair and electrically grounded.	Yes/No	
✓ Tops of cabinets and shelves are free from stored items.	Yes/No	
✓ Heavy objects are confined to lower shelves.	Yes/No	
✓ Glassware is free from cracks, chips, sharp edges and other defects.	Yes/No	
✓ Broken glass containers are available and in use.	Yes/No	

Continued on next page

Laboratory Safety Inspection Checklist - Annual, Continued

III. Personal Protective Equipment

	Yes/No	Comments
✓ Protective gloves are available and matched to hazards involved.	Yes/No	
✓ Eye protection is available and in use in all laboratories.	Yes/No	
✓ Lab coats, Tyvek garments, etc. are available and in use.	Yes/No	
✓ Lab coats are only worn in the laboratory and are removed before entering offices, lunchrooms, restrooms, conference rooms, and other non-laboratory general use areas. (This includes disposable protective clothing).	Yes/No	
✓ Dirty lab coats/uniforms are stored in a covered container until removed for laundering.	Yes/No	
✓ Appropriate protective clothing is available and in use when working with radioactive materials.	Yes/No	
✓ Respirators are provided when necessary, and selected on the basis of hazard present.	Yes/No	
✓ Respirators are used correctly, cleaned after every use, and stored in a convenient, clean, and sanitary area.	Yes/No	

IV. Hazard Communication

	Yes/No	Comments
✓ Primary and secondary chemical containers are labeled with identity, appropriate hazard warnings, and expiration dates.	Yes/No	
✓ Signs on storage areas (for example, refrigerators) and laboratory areas are consistent with hazards within.	Yes/No	
✓ MSDS binders are available for chemicals used, and stored in area.	Yes/No	
✓ Employees know the location of the MSDS binders for their work area.	Yes/No	
✓ Satellite MSDS collections are complete and readily available at all times to lab personnel.	Yes/No	

Continued on next page

Laboratory Safety Inspection Checklist - Annual, Continued

V. Chemical Storage

	Yes/No	Comments
✓ Incompatible materials are segregated.	Yes/No	
✓ Corrosives and flammables are stored below eye level.	Yes/No	
✓ Hazardous materials used/stored in the laboratory are limited to small quantities.	Yes/No	
✓ Unnecessary, unused, or outdated materials are removed from laboratories and chemical storage areas.	Yes/No	
✓ Safety carriers are available and **in use while transporting chemicals.**	Yes/No	
✓ All lab carts have side rails.	Yes/No	
✓ All containers are properly labeled with: **Name, Date, Contents**	Yes/No	

VI. Flammable Liquids Storage & Handling

	Yes/No	Comments
✓ Flammable liquids are stored and used away from ignition sources.	Yes/No	
✓ Bulk quantities of flammable liquids are stored in approved storage cabinets.	Yes/No	
✓ Flammable liquid storage cabinets are properly labeled.	Yes/No	
✓ Flammable liquid storage cabinets close properly.	Yes/No	
✓ Flammables stored on open shelves in glass or plastic containers are within permissible quantities	Yes/No	
✓ Safety cans used to handle small quantities of flammable liquids are properly labeled.	Yes/No	
✓ Solvent waste cans are labeled properly with: **Name, Date, Contents,**	Yes/No	
✓ Nothing is stored on top of flammable cabinets.	Yes/No	

Continued on next page

Laboratory Safety Inspection Checklist - Annual, Continued

VII. Compressed Gas Cylinders

	Yes/No	Comments
✓ Gas cylinders are properly chained/secured.	Yes/No	
✓ Cylinder caps are in place when cylinders are not in use or being moved.	Yes/No	
✓ Gas cylinders are transported on a cart with chains.	Yes/No	
✓ Gas cylinders are stored away from excessive heat.	Yes/No	
✓ Fuel gas cylinders are at least 20 feet away from oxygen cylinders.	Yes/No	
✓ Gas cylinders are properly marked as to their contents.	Yes/No	
✓ Full and empty cylinders are stored separately.	Yes/No	
✓ Empty gas cylinders are labeled "EMPTY."	Yes/No	
✓ Gas lines, piping, manifolds, etc. are labeled with the identity of their contents.	Yes/No	
✓ Hoses, tubing, and regulators are in good working condition.	Yes/No	

VIII. Waste Handling: Hazardous and Non-Hazardous

	Yes/No	Comments
✓ No liquid waste (with exception of acid solution) is disposed of in the sinks or the sewer.	Yes/No	
✓ Acid neutralizing sink is functioning properly.	Yes/No	
✓ Hazardous wastes are not accumulated for longer than 6 months in the laboratory.	Yes/No	
✓ Waste streams are separated as necessary (for example, solid vs. liquid, hazardous vs. non-hazardous, halogenated vs. non-halogenated, etc.	Yes/No	
✓ Waste containers are appropriately labeled before placing in waste storage area.	Yes/No	
✓ Containers of hazardous waste are labeled properly with the date and name of person discarding waste.	Yes/No	
✓ Waste material is not allowed to accumulate on the floors, in corners, or under shelves/tables in laboratories.	Yes/No	

Continued on next page

Laboratory Safety Inspection Checklist - Annual, Continued

IX. Means of Egress and Emergency Exits

	Yes/No	Comments
✓ Exits are clearly marked.	Yes/No	
✓ Exits are free from obstruction.	Yes/No	
✓ All fire doors are self-closing.	Yes/No	
✓ All fire doors are kept closed.	Yes/No	
✓ Fire alarms are provided.	Yes/No	
✓ Telephones are labeled with emergency numbers.	Yes/No	
✓ Emergency evacuation routes are clearly posted.	Yes/No	
✓ Emergency evacuation routes are posted in common hallways.	Yes/No	
✓ Emergency exit lights are working and clear of obstruction.	Yes/No	

X. Safety Equipment

	Yes/No	Comments
✓ Safety showers and eye wash stations are located within 75 feet of all laboratories.	Yes/No	
✓ Safety showers and eye wash stations are clearly labeled, and these areas are clear from obstruction.	Yes/No	
✓ All showers and eye wash stations are clean, covers are replaced, and they in good working condition.	Yes/No	
✓ Fire extinguishers are available.	Yes/No	
✓ Fire extinguishers are the appropriate type for the hazard in the work area.	Yes/No	
✓ Fire extinguishers are checked monthly. Date of last check: _____	Yes/No	
✓ Fire detection devices, smoke alarms, sprinkler systems, and lighted exit signs are in good working condition.	Yes/No	
✓ First-aid supplies are readily available and clearly visible.	Yes/No	
✓ Spill team list is clearly posted in laboratories.	Yes/No	
✓ Employees know where safety equipment is located and how to operate it.	Yes/No	

Continued on next page

Laboratory Safety Inspection Checklist - Annual, Continued

XI. Other Labeling & Posting

	Yes/No	Comments
✓ Warning signs and labels are present whenever required (for example, carcinogen, mutagen) where chemicals are stored.	Yes/No	
✓		
✓		

XII. Miscellaneous & Notes

Appendix 12

Chemical Disposition Sheet

Purpose

This form is to be used for inventory tracking purposes. The form should be completed whenever a substantial amount of a chemical is used, a container is emptied, or the chemical is disposed of. The form is to be provided to the Chemical Hygiene Officer, who will then enter the information into the Materials Laboratory's Chemical Inventory Database.

Responsibility

The person who disposes of the chemical should complete the form.

Form

The following information should be recorded:

Item	To Complete
Chemical Name	
Common Name	
CAS Number	
Manufacturer	
Catalog Number	
Hazard Class	
MSDS	
Date Received	
Expiration Date	
Location	
Amount	
Current Amount	
Recommended Reorder Amount	
Alternate Names	

Appendix 13

Laboratory Employee Training and Awareness Checklist

Employee Name: Supervisor Name:

Employee Job Title: Initiation Date:

General Topic	Training Requriement	Required for All Employee (Yes/No)	Require Refresher (Yes/No)	Training Methodology	Trained By	Training Date	Signature
Environmental Health and Safety Manual Content	Know the location, general content, and how to use the manual	Yes		New employee orientation			
Facility Information	Know who the primary and secondary facility contacts and emergency coordinators are	Yes		New employee orientation			
Chemical and Waste Management Procedures							
	Chemical procurement policies and procedures			On-the-Job Training			
	Chemical receipt and distribution procedures			On-the-Job Training			
	Chemical storage requirements and guidelines			On-the-Job Training			
	Chemical storage and retrieval proceures			On-the-Job Training			
Basic Lab Safety							
	General Laboratory Safety Principles and Practices			New employee orientation			
	General chemical hazards and control			On-the-Job Training			
	Use of Personal Protective Equipment			On-the-Job Training			
	Know locations of						
	• Chemical Hygiene Plan (included in the Environmental Health and Safety Manual)			New employee orientation			
	• Fire extinguishers and pull stations			New employee orientation			
	• Eyewash/douse showers			New employee orientation			
	• First aid kits			New employee orientation			
	• Hazardous materials spill kits			New employee orientation			
	Know proper operations of the following:						
	• Fume hood			On-the-Job Training			
	• Fire extinguishers			Classroom Training			
	• Eyewash/douse showers			Classroom Training			
	Safety requirements of compressed gases			On-the-Job Training			
	How to perform CPR/First Aid			Classroom Training			
	Hazardous chemical labeling			On-the-Job Training			

Laboratory Employee Training and Awareness Checklist

Employee Name: Supervisor Name:

Employee Job Title: Initiation Date:

General Topic	Training Requriement	Required for All Employee (Yes/No)	Require Refresher (Yes/No)	Training Methodology	Trained By	Training Date	Signature
Hazardous Waste Disposal							
	Regulations pertaining to the identification, accumulation, and reporting of hazardous wastes			Classroom Training			
	Laboratory waste disposal practices, including locations and supplies			On-the-Job Training			
Medical Program	Policy related to medical surveillance, consultation and examination			New employee orientation			
Hazard Communication							
	Know location and content of MSDS			New employee orientation			
	Labeling requirements			New employee orientation			
	External communication procedures	Yes		New employee orientation			
	Corrective action and recommendation policies and procedures	Yes		New employee orientation			
Inspection and Monitoring							
	Weekly Inspection Procedures for the Hazadous Material and Waste Storage Units			On-the-Job Training			
	Weekly Inspection Procedures for the Satellite Hazadous Material and Waste Storage Units			On-the-Job Training			
	Monthly Loaboratory Safety Equipment Inspection Procedures			On-the-Job Training			
	Annual Laboratory Safety Inspection Procedures			On-the-Job Training			
Lab-specific procedures							
	Treatment of polyer resin waste			On-the-Job Training			
	Neutrliaze acidic solutions in acid sink			On-the-Job Training			
	Instrument and Container Cleaning			On-the-Job Training			
Hazardous Chemicals	Proper procedures for storage and handling of the following chemicals:						
	• Carcinogens such as benzene and formaldehyde			On-the-Job Training			
	• Hydrofluoric Acid			On-the-Job Training			
	• Perchloric Aicd			On-the-Job Training			

Laboratory Employee Training and Awareness Checklist

Employee Name: Supervisor Name:

Employee Job Title: Initiation Date:

General Topic	Training Requriement	Required for All Employee (Yes/No)	Require Refresher (Yes/No)	Training Methodology	Trained By	Training Date	Signature
Hazardous Material Shipment	Proper procedures for shipment of hazardous material.			Classroom Training			
Other							